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# REVIEW

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MAGEE (C. J.). **Tomato leaf mould. A disease new to glasshouse crops in New South Wales.**—*Agric. Gaz. New South Wales*, xlv, 1, pp. 24–26, 1 fig., 1934.

In this brief popular note the author reports what is apparently the first appearance of tomato leaf mould (*Cladosporium fulvum*) in New South Wales in the winter of 1933. It caused severe losses to most of the growers in the more important centres where tomatoes are grown under glass, and was also recorded affecting early outdoor tomatoes in the vicinity of infected glasshouses. It is not believed that the disease is likely to do considerable damage in glasshouses during the spring months, as the houses are not heated, but later in the season it is thought that both temperature and humidity may often favour infection and the development of the fungus, and for this reason some recommendations are given for the control of the disease [*R.A.M.*, xi, p. 211 ; xii, p. 403].

STAPP (C.). **Vom 'Ulmensterben'.** [On the 'die-back of Elms'.] —*Mitt. Deutsch. Dendrol. Gesellsch.*, xlv (*Jahrbuch*), pp. 276–282, 1933.

Discussing the various theories advanced in connexion with the etiology of the die-back of elms in Germany, the writer reaffirms his conviction that the primary part is taken by *Ceratostomella ulmi* in the causation of the disease [*R.A.M.*, xi, p. 336; xiii, p. 406]. Recent investigations on the problem are summarized, and a list is given of the legislative measures enacted in Germany against the die-back [ibid., xii, p. 591].

ANSALONI (A.). **La moria degli Olmi e la diffusione in Italia dell' Olmo siberiano.** [The die-back of Elms and the distribution in Italy of the Siberian Elm.]—118 pp., 24 pl., Bologna, Edit. Selva, 1934. [Abs. in *Journ. Forest. Suisse*, lxxxv, 5, pp. 119–120, 1934.]

This is a review by H. Badoux of a treatise on the die-back of elms (*Ulmus campestris*) due to *Graphium* [*Ceratostomella*] *ulmi* in Italy, where this tree serves the practical purpose of supporting vines, especially in Romagna and Emilia [*R.A.M.*, xii, p. 734], in addition to its ornamental value. Promising results have been obtained in various parts of the country by experiments on the part of landowners and agriculturists, with the collaboration of

the Silvicultural Research Institute of Florence, in the cultivation of *Ulmus pumila*, which seems well adapted to replace the susceptible *U. campestris* [ibid., xiii, p. 406].

HAHN (G. G.) & AYERS (T. T.). **Dasyscyphae on conifers in North America. I. The large-spored, white-excipled species.**—*Mycologia*, xxvi, 1, pp. 73–101, 6 pl., 1934.

Following the detection in 1927 of the European larch (*Larix europaea* DC.) canker in Massachusetts [*R.A.M.*, vii, p. 285], a study was made of the relationships of the fungi associated with the disease. Detailed morphological, cultural, and taxonomic investigations indicate that the introduced parasite identified on imported *L. europaea* and *L. leptolepis* should be known as *Dasyscypha willkommii* (Hartig) Rehm [ibid., vii, p. 209; ix, pp. 90, 617] and not as *D. calycina* (Schum.) Fuckel [ibid., xi, p. 141]. The organism was consistently found in the cankers on living tissue. The blue form [var. *glauca*] of Douglas fir (*Pseudotsuga taxifolia*) growing in close proximity to infected *L. europaea* did not contract the disease; inoculations with *D. willkommii* were successful on young larch trees, but not on dead or dying tissues of the same host or on healthy or dying Douglas firs.

*D. calycina* was found to be morphologically and physiologically distinct from *D. willkommii* and should be recognized as a separate species, of which an amended description is given in English. Its purely saprophytic behaviour on *L. europaea*, *L. leptolepis*, and *P. taxifolia* has been sufficiently proved by inoculation experiments. It is believed to have been introduced into the United States at the same time as *D. willkommii*, being co-extensive with the latter. Both the foregoing species of *Dasyscypha* were found to differ morphologically and physiologically from the large-spored native forms, hitherto identified with one or the other but which the authors describe [with English and Latin diagnoses] as new species, namely, *D. oblongospora* on *L. laricina*, *L. europaea*, *L. leptolepis*, *P. taxifolia* (blue form), *Picea pungens*, *Pinus pungens*, and *P. virginiana*; and *D. occidentalis* on *L. occidentalis*, *L. laricina*, and *L. leptolepis*. These species do not cause canker on their hosts.

LIESE (J.). **Weitere Mitteilungen über die Douglasiennadelschütte.** [Further notes on the needle fall of Douglas Firs.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xlv (*Jahrbuch*), pp. 268–270, 1933.

In view of the extension of the leaf fall disease (*Rhabdocline*) [*pseudotsugae*] of Douglas firs (*Pseudotsuga taxifolia*) over a much wider area of Germany than was originally realized, the writer relinquishes his advocacy of direct control by eradication in favour of v. Geyr's plan for the gradual development of resistance by individual selection [*R.A.M.*, xii, pp. 66, 67]. At the time of writing in 1933 there were no less than 60 centres of infection, mostly in Mecklenburg, Schleswig-Holstein, and Brandenburg, but also scattered through Pomerania, Brunswick, Oldenburg, Lower Silesia, and the Palatinate.

LAGERBERG (T.). **Phomopsis pseudotsugae Wilson, en i Sverige obeaktad barrträdsparasit.** [*Phomopsis pseudotsugae* Wilson, a conifer parasite hitherto unnoticed in Sweden.]—*Svenska Skogsvårdsfören. Tidskr.*, xxxii, 1–2, pp. 71–86, 4 figs., 1934. [English summary.]

*Phomopsis pseudotsugae* [*R.A.M.*, xiii, p. 199] was identified for the first time in Sweden in 1927 by G. G. Hahn on the trunk of a twelve-year-old Douglas fir (*Pseudotsuga taxifolia* var. *caesia*) from Vestrogothia. The disease was originally observed by the writer in 1917 and attributed to *Phoma pitya* [*Sclerophoma magnusiana*: ibid., viii, p. 278; xii, p. 790], an error that was corrected in *Skogen*. p. 262, 1929. On a joint inspection with Hahn of the 15-year-old Douglas fir stand in the arboretum of the College of Forestry the presence of *Phomopsis pseudotsugae* was also detected.

The studies made by M. Wilson on the fungus in Great Britain are summarized [ibid., v, p. 259]. As far as the writer's observations extend, the place of origin of the trees does not influence their reaction to *P. pseudotsugae*. In Sweden infection occurs principally on *Pseudotsuga taxifolia* var. *glauca*, the young shoots on stems and branches being attacked and cankers formed on the thicker parts exactly as described by Wilson. In 1932 four- to five-year-old larches (*Larix leptolepis*) in Scania were also found to be infected by *Phomopsis pseudotsugae*, which had evidently penetrated the bark in the previous autumn through wounds inflicted by rabbits or voles. The upper part of the main stem on some 20 per cent. of the trees was killed, the pycnidia of the fungus being developed in profusion on the area immediately above the living part of the trunk. In this case the symptoms do not altogether agree with those described by Wilson, whose observations, however, were made on 12- to 18-year-old trees.

CAMPBELL (A. H.). **Zone lines in plant tissues. II. The black lines formed by Armillaria mellea (Vahl) Quél.**—*Ann. of Appl. Biol.*, xxi, 1, pp. 1–22, 3 pl., 4 figs., 1934.

The results of the investigation described in some detail in this paper showed that, as in *Xylaria polymorpha* [*R.A.M.*, xii, p. 544], the black lines formed in wood infected by *Armillaria mellea* are the sectional outlines of closed bodies, enclosing an extensive matrix of the substratum, the formation of which is very similar in both fungi [loc. cit.]. These bodies, for which the name pseudosclerotia is suggested, because by the structure of their limiting walls and by their physiological function they partake of the nature of a true sclerotium, are continued on the surface of the substratum by an effused mycelial mass (the xylostroma) which is partly immersed in the wood and consists of a black rind of bladder hyphae with a medulla of hyaline ones. The xylostroma, probably owing to its immersion in a hard woody substratum, is endowed with the power of apical growth, resulting in the free portion of this body growing out into a number of slender flattened strands below the bark of the tree (*Rhizomorpha subcorticalis* of Persoon), from which the more cylindrical strands (*R. subterranea*) eventually grow out into the soil through the cracks in the bark. The formation of the

pseudosclerotia and the development of the rhizomorphs were also observed by the author in pure cultures of *A. mellea* on synthetic media and sterilized blocks of wood.

The paper terminates with a short account of the biology of *A. mellea*, with particular reference to the significance of the pseudosclerotium in the reproduction of the fungus.

DAY (W. R.) & PEACE (T. R.). **The experimental production and the diagnosis of frost injury on forest trees.**—*Oxford Forestry Mem.* 16, 60 pp., 10 pl., 5 graphs, 1934.

A full report is given of experiments on the artificial production of frost damage based on the exposure of small trees in pots to low temperatures produced in a refrigerating chamber. The evidence obtained showed that, in general, susceptibility to frost damage increases during spring, is at a maximum during summer, and decreases in the autumn till it reaches a minimum in winter. The critical temperatures at different times of the year for the species used are tabulated and expressed graphically. An intimate relation was established between the degree of susceptibility to frost injury and the extent to which the growing season of the plant coincides with that period of the year which is free or comparatively free from frosts. The susceptibility of particular parts of a plant to injury was found to be directly related to the manner in which growth is renewed in spring. Susceptibility to frost injury increases throughout the period of bud development and wood formation, with the result that first the buds or new shoots, then the older shoots bearing them, and subsequently the parts of the larger stems on which these shoots are situated become increasingly susceptible; this explains why so many frost cankers develop round a bud or shoot. Both lightning and lack of water cause the formation of zones of abnormal tissue that are identical in type to frost rings [the development of which is described in detail: *R.A.M.*, xi, p. 140], though sometimes different in detail.

A bibliography of 78 titles is appended.

MELIN (E.). **Activities of some fungi in the different horizons of forest duff, as measured by $CO_2$-evolution.**—*Svenska Skogsvårdsfören. Tidskr.*, xxxii, pp. 147–156, 4 graphs, 1934. [Swedish summary.]

The writer has previously shown (*Svenska Skogsvårdsfören. Tidskr.*, 1928) that in several North American forest types the carbon dioxide evolution is greater in the fermentation (F) than in the humified (H) layers (cf. H. Hesselman, *Medd. Statens Skogsförsoksanst.* 22, 23, 1926–7). During 1927–8 the writer examined in New Jersey the differences in the activities of micro-organisms in the F- and H-layers.

Pure cultures of the following fungi were used in the experiments: *Catharinea humicola* Nannf. (a cellulose-decomposing organism to be described later by J. A. Nannfeldt, isolated from the H-layer of a hardwood-spruce forest in Maine); *Mucor ramannianus* [*R.A.M.*, ix, p. 676], from the F-layer of a mixed conifer forest, Maine; *Cladosporium herbarum*, from the H-layer of a mixed conifer forest, Södermanland, Sweden; and *Trichoderma lignorum*

[ibid., xii, p. 534], from the F-layer of a spruce forest, Maine. The tests were carried out by Waksman's and Starkey's method [ibid., iii, p. 362], 10 gm. of dry matter of each of the humus samples being placed in culture flasks in which the water content was regulated to 100 per cent. of the dry matter. After autoclaving, 1 c.c. of a spore or humus suspension was added. The experiments were carried out at 25° C. and continued for 34 days, titration being done daily or on alternate days according to the amount of carbon dioxide evolved.

The activities of all the species under observation were greater in humus from the F- than in that from the H-layers, especially that of *C. herbarum*, which produced 59 times more carbon dioxide in the former than in the latter; the corresponding differences for *Catharinea humicola*, *M. ramannianus*, and *T. lignorum* were 20·6, 1·4, and 1·9 times, respectively.

FINDLAY (W. P. K.). **Studies in the physiology of wood-destroying fungi. I. The effect of nitrogen content upon the rate of decay of timber.**—*Ann. of Botany*, xlviii, 189, pp. 109–117, 1934.

When sample blocks of the seasoned heartwood of Sitka spruce (*Picea sitchensis*) oven-dried at 100° C. for 18 hours, were weighed, impregnated with a sterilized nitrogenous solution, re-dried, and exposed to attack by *Trametes serialis* [*R.A.M.*, xi, p. 342] in culture flasks for two or three months at 23°, and the loss in weight due to fungal decay determined as a percentage of the original dry weight (similar control blocks receiving identical treatment except that they were injected with sterilized water only), the results obtained [which are tabulated and discussed] showed that ammonium nitrate in low concentrations slightly increased the rate of decay. The largest increase occurred in blocks treated with 0·5 per cent., which lost 15·08 per cent. in weight, as compared with 10·62 per cent. in the controls. The addition of an organic source of nitrogen markedly stimulated fungal growth, increasing the loss in weight from 25·8 per cent. in the controls to 40·8 per cent. in the blocks treated with 1 per cent. peptone and to 37 per cent. in those treated with 1 per cent. asparagin.

Similar experiments in which beech blocks were exposed to attack by *Polystictus versicolor* gave less significant results, though in one instance pieces treated with 0·1 per cent. ammonium nitrate lost 19·36 per cent. weight as compared with 16·15 per cent. in the controls.

RUDGE (E. A.). **Studies in the decomposition of timber under industrial conditions. V. Dry rot.**—*Journ. Soc. Chem. Ind.*, liii, 6, pp. 38T–40T, 2 figs., 1934.

Practically all the serious dry rot in houses in Great Britain may be referred to *Merulius lacrymans* [*R.A.M.*, xii, pp. 68, 739], but in two cases investigated at the Technical College, Cardiff, there were no obvious signs of fungus growth. The first specimen was a portion of a wainscot skirting from the living room of a house. Decay (with dry rot symptoms) was detected two years ago, five years after the board was fixed against a black plaster

wall which was subsequently found to be extensively rotted. An analysis of the ash content indicated that the extent of decay was parallel with the degree of acquisition of calcium oxide. The presence of a lead priming coat on the outer surface of the wood failed to prevent the infiltration of inorganic matter from the wall, the plaster of which was found to consist of a lime-ash mixture.

The specimens in the second case were portions of deal joisting from beneath the floor of a modern dwelling house. The joists had been embedded to within a fraction of an inch of their top surfaces in inferior porous concrete, 9 in. thick, and resting on the subsoil foundations. After four years of service the entire flooring was removed in a state of collapse. Here again there was no apparent evidence of fungus growth. The wood was damp to the touch and the outer layers were friable. On analysis this wood was also found to be infiltrated by mineral matter, parallel in extent with the decay of the fibres. There was an abnormally high alkali chloride content, presumably derived from the sand of the concrete. Much of the infiltrated inorganic matter was shown to be associated with the cellulose.

These observations are considered to indicate that the fungous infection in dry rot is subsequent to an ionic intrusion into the woody tissues, and that the delayed or suppressed development of the fungus does not prevent the extensive spread of typical dry rot.

MEYER (A.). **Sur l'emploi des sels du dinitrophénol et du dinitrocrésol comme anticryptogamiques et parasiticides.** [On the use of dinitrophenol and dinitrocresol salts as fungicides and insecticides.]—*Comptes rendus Acad. d'Agric. de France*, xx, 1, pp. 43–46, 1934.

Attention is drawn to the toxicity to man and domestic animals of the dinitrophenol and dinitrocresol salts now coming into commercial use as fungicides and insecticides. Dinitro-orthro-cresol has long been employed in Germany in the preparation of the timber preservative antinonnin [*R.A.M.*, xi, p. 84], and the dinitrophenol salts are now being recommended there for similar purposes.

BLANK (I. H.). **Studies in the physiology of molds. IV. Moulding of chrome tanned skins.**—*Journ. Amer. Leather. Chem. Assoc.*, xxviii, 12, pp. 583–593, 1933.

The results [which are fully discussed and tabulated] of tests to determine the inhibitory action of a number of substances on the growth of *Aspergillus niger* in modified Czapek's broth showed that next to mercuric chloride, which inhibited growth at 1 in 40,000 to 1 in 50,000 and killed the spores at 1 in 10,000 to 1 in 20,000, o-nitrophenol was the most powerful agent in preventing growth (1 in 20,000 to 1 in 30,000) while p-nitrophenol was the best fungicide (1 in 7,000 to 1 in 8,000). The sodium salt of beta naphthol inhibits growth at 1 in 10,000 to 1 in 20,000 and destroys the spores at 1 in 2,000 to 1 in 3,000 and is stated to have been used in tanneries for some time.

The practical application of some of these substances to the prevention of mould growth on moist chrome-tanned skins, heavily inoculated with *Penicillium* spp., was also tested [cf. *R.A.M.*, xii, p. 94], and p-nitrophenol (1 in 5,000) was found to be the most useful for this purpose. It is an inexpensive solid material, easy to handle, soluble in water, and capable of permeating the skins in such a way as to inhibit mould growth for a period consistent with all tannery operations. P-nitrophenol is judged, on the basis of these experiments, to be as efficient as three times its weight of β-naphthol.

BUDDIN (W.). **The canker and the dry rot diseases of Swedes.**— *Min. of Agric. and Fish. Bull.* 74, 47 pp., 8 pl., 1934.

Ample evidence is stated to have been forthcoming, from the writer's investigations and those of his collaborators in Great Britain, that the species of *Phoma* constantly associated with the canker disease of swede plants grown for seed production is identical with the agent of dry rot in the root crop (*P. lingam*) [*R.A.M.*, xii, p. 481]. Seedling infection with the same fungus was observed on a few occasions, when it caused the shoot system to wither completely, so that its further course could not be followed, but pycnidia were formed under very moist conditions on the dead stems or cotyledons. The dirty white, light brown- or yellow-edged lesions formed by *P. lingam* on the leaf blades are somewhat inconspicuous, while the fungus has also been isolated from small, diseased areas on the bulblet or near the stem apex where they may readily escape notice. The obvious canker phase may, in fact, ultimately be of less importance in the spread of *P. lingam* than some of these inconspicuous forms of disease.

During these investigations Cunningham's observations on the occurrence of *P. lingam* on swede seed pods [ibid., vii, p. 70] were abundantly verified among the commercial plantings of Great Britain. When a seed lying beneath a lesion on the pod is invaded by the pathogen at a sufficiently early stage, the mycelium ramifies throughout the tissues and so prevents further development. Inoculation tests with spore suspensions of *P. lingam* showed that little progress is made by the disease on semi-mature pods.

Isolations from swede seed of fungi apparently agreeing with Cunningham's descriptions of supposed strains of *P. lingam* comprising his group I [loc. cit.] proved almost or entirely non-pathogenic on healthy roots. Only two of the strains received from New Zealand, belonging to Cunningham's group II, corresponded with the writer's conception of *P. lingam* and gave definite evidence of parasitism on swedes, the remaining five differing specifically from *P. lingam*. The results of tests by the germinator method on between 200 and 300 samples of commercial seed stocks showed that only about a quarter were infected by *P. lingam*, and those merely to the extent of 0·2 per cent. or less. It may be concluded, therefore, that infected individuals are extremely rare in most British commercial swede seed stocks, and unless some hitherto unknown factor should prove capable of stimulating and extending

this form of attack, it can for the present be disregarded for practical purposes.

Experiments at Reading showed that white mustard (*Brassica alba*), charlock (*B. arvensis*), and wild radish (*Raphanus raphanistrum*) are susceptible to *P. lingam*, while abundant spontaneous infection of *B. alba* var. *melanosperma* was observed in Dorset swede fields in 1930–1. No indication was observed in that county of insect transmission of the fungus as recorded by Cottier in New Zealand [ibid., xii, p. 134], and it is considered probable that infection is mainly disseminated by the weed hosts of the fungus, the débris of a previous diseased crop, or other like sources.

Promising results in the disinfection of artificially infected seeds were given by the following treatments: coating with granosan (the American Du Bay ceresan, containing 2 per cent. ethyl mercury chloride) [ibid., xii, p. 140] to the capacity of the seed, immersion in hot water (50° C.) for 25 minutes [ibid., vii, p. 758], and 30 minutes' immersion in 0·25 per cent. semesan at 46° preceded by several hours' soaking in water at room temperature. These methods reduced the incidence of infection from 44 and 18 per cent. in the germinator and soil pans, respectively, to 0 and 0·2 per cent. (granosan), 0·5 and 0 per cent. (hot water), and 1 and 0·2 per cent. (long hot semesan), respectively.

WALKER (J. C.). **Production of Cabbage seed free from Phoma lingam and Bacterium campestre.**—*Phytopath.*, xxiv, 2, pp. 158–160, 1934.

For the past ten years or more it has been observed that the cabbage seed crop in the Skagit Valley, Washington, and the crops raised from such seed in other localities are generally free from the agents of blackleg (*Phoma lingam*) and black rot (*Bacterium campestre*) [*Pseudomonas campestris*: *R.A.M.*, vii, p. 758; x, p. 151]. The absence of infection is attributed to the low rainfall in the district between May and September, eliminating the principal channel of dissemination by spattering drops. This conclusion was further strengthened by the virtual absence of the diseases in experimental plantings from heavily infested seed in the Skagit Valley. Of recent years a large proportion of commercial cabbage seed production in the United States has been transferred to the area in question, partly on account of its reputation for clean material.

PIERCE (W. H.). **Viroses of the Bean.**—*Phytopath.*, xxiv, 2, pp. 87–115, 5 figs., 1934.

In the course of studies at Wisconsin University on the resistance of beans (*Phaseolus vulgaris*) to common mosaic (bean virus 1), four other viruses were investigated on the bean, namely yellow bean mosaic virus (bean virus 2), lucerne mosaic virus (lucerne virus 2), ordinary tobacco mosaic virus (Johnson's tobacco virus 1), and tobacco ring spot virus [cf. *R.A.M.*, xii, pp. 414, 614, 741.] Of these only the two first were found on beans in nature.

Bean viruses 1 and 2 (the latter secured from a Red Valentine plant at Madison in 1931) both produced systemic infection, which

was much more virulent with virus 2. Lucerne virus 2, isolated from a strain of Turkestan lucerne showing symptoms of mottling and dwarfing apparently distinct from those caused by ordinary mosaic (lucerne virus 1) on this host [ibid., x, p. 388], and ordinary tobacco mosaic produced only local necrosis on beans, which developed both local and systemic infection, however, on inoculation with ring spot [ibid., viii, p. 139]. The symptoms on differential varieties are described.

The 24 bean varieties used in the tests [the results of which are fully discussed and tabulated] are grouped according to reaction to bean virus 1 as either susceptible, tolerant, or immune [ibid., xi, p. 561], and in general the same classification holds good for reaction to bean virus 2, although no variety showed immunity from this disease.

The thermal death points of bean viruses 1 and 2 were found to lie between 56° and 58° C. (ten minutes' exposure); of lucerne virus 2 between 62° and 64°; and of tobacco ring spot at 66° [ibid., xii, p. 108]. In ageing *in vitro* experiments bean viruses 1 and 2 lost their infectivity after 24 to 32 hours, the corresponding period for lucerne virus 2 and tobacco ring spot being 7 to 9 days. The infectivity of all these viruses was lost or reduced to a minimum at dilutions exceeding 1 in 1,000. Both the bean viruses were inactivated by 30 minutes' treatment with 50 per cent. alcohol [ibid., x, p. 284] and the lucerne virus with 75 per cent. At the latter concentration the tobacco ring spot virus was not inactivated when the inoculation tests were made on Refugee Green beans, but on Henderson Bush Lima (*P. lunatus*) no local lesions were produced after treatment at this strength. The following concentrations of 37 per cent. formaldehyde proved toxic: bean virus 1, 1 in 500, bean virus 2, 1 in 1,000, lucerne virus 2 and ring spot, 1 in 100 (1 in 200 for ring spot on Bush Lima beans).

Both bean viruses, 1 and 2, were transmitted by *Macrosiphum solanifolii* [*M. gei*] and *Illinoia* [*M.*] *pisi*, the latter transmitting also lucerne virus 2. No evidence of seed transmission of bean virus 2 was obtained, though bean virus 1 is seed borne.

Additional hosts of bean virus 1 [ibid., xi, p. 417] are *P. aureus*, *Lespedeza striata*, and spring vetch [*Vicia sativa*], while bean virus 2 was found to have the same host range except that it failed to infect some of the Bush Lima beans (*P. lunatus*), and *P. calcaratus*, and infected white sweet clover (*Melilotus alba*), soy-bean, white lupin (*Lupinus albus*), and crimson clover (*Trifolium incarnatum*) which are not susceptible to the common form. Systemic infection by lucerne virus 2 occurred on *Dolichos lablab*, *P. aureus*, lucerne, *M. alba*, *Trifolium* spp., peas, broad beans, soy-beans, *Petunia hybrida*, tobacco (*Nicotiana tabacum* and *N. glutinosa*), and some other hosts. Ordinary tobacco mosaic failed to infect any of the Leguminosae except *Phaseolus vulgaris*. Ring spot, however, caused systemic infection, usually followed by death, of white lupins, cowpeas, *Vigna sesquipedalis*, soy-beans, broad beans, *Vicia sativa*, *Stizolobium* sp., *P. aureus*, *P. calcaratus*, and many common bean varieties.

A summarized scheme for the identification of the five viruses on differential hosts is given in tabular form.

BÖNING (K.). **Die Fettfleckenkrankheit der Bohnen.** [The grease spot disease of Beans.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, xi, 11, pp. 265–269, 1 fig., 1934.

The grease spot disease of beans [*Phaseolus vulgaris*], caused by *Pseudomonas* [*Bacterium*] *medicaginis* var. *phaseolicola*, was first observed by the writer in a Munich market-garden in 1931, and by 1933 it had spread to several other establishments. The causal organism is believed to have been introduced on seed from southern Europe. The symptoms of the disease are described in popular terms and measures for its control discussed [*R.A.M.*, xi, p. 687].

LEHMAN (S. G.). **Frog-eye (Cercospora diazu Miura) on stems, pods, and seeds of Soybean, and the relation of these infections to recurrence of the disease.**—*Journ. Agric. Res.*, xlviii, 2, pp. 131–147, 2 pl., 1934.

The author states that since his first record of *Cercospora diazu* [*C. daizu*: *R.A.M.*, xi, p. 87] on the leaves of soy-beans in the United States [ibid., vii, p. 760 *et passim*], the fungus has been frequently observed in the field on the stems, pods, and seeds of this host, and he gives a detailed account of the lesions formed on each of these organs. On the stems the parasite is chiefly confined to the cortex, and injury to the phloem and cambium, which are less often invaded, is usually due to the diffusion of toxic substances from the necrotic cortex. On the pods the lesions are usually round, somewhat sunken, 1 to 4 mm. in diameter, at first brown or reddish-brown but when dry light brown with a dark brown margin. The mycelium penetrates the thin white membrane lining the pod and closely invests the seeds, portions of the diseased membrane often adhering to the seed coat; no definite lesion or discoloration is produced on the latter, but there is often a slight depression and a lack of the smoothness and lustre characteristic of the coats of healthy seeds. In the great majority of infected seeds the growth of the fungus is superficial and is easily controlled by seed disinfectants. Infection of the embryo occurs rarely, if at all. In potato agar test tube cultures the fungus remained viable for about 17 months.

The infection was shown to be carried over winter on diseased leaves and stems left in the field from the previous crop, but ploughing-in of infected stubble in the autumn was not found to be a practicable method of preventing or even appreciably retarding the development of the disease the next season. Further territorial spread of the disease may be prevented by the use of healthy seed.

NEUWIRTH (F.). **Ökologie der aufgehenden Rübe mit Berücksichtigung ihrer Krankheiten. Die fakultativen Parasiten, ihr gegenseitiges Verhältnis und ihre Beziehung zur Wirtspflanze. II. Teil.** [The ecology of the germinating Beet with reference to its diseases. The facultative parasites, their mutual relationship, and their connexion with the host. Part II.]—*Zeitschr. für Zuckerind.*, lviii, 21, pp. 153–160, 1934.

The writer discusses the mutual relationships of the facultative parasites associated with root rot of beets in Czecho-Slovakia in

the light of his own observations and those of other workers [cf. *R.A.M.*, xiii, p. 347]. Four groups of plants were differentiated in the field on the basis of macroscopic symptoms, viz., (1) those with a strangulated appearance or a brown to black discoloration of the hypocotyl; (2) those with a blackening of petioles and bases of the cotyledonary leaves; (3) those with a diseased basal portion of the root; and (4) those with apical blackening and desiccation of the cotyledonary leaves. In 1926 most of the 200 plants examined contained hyphae and oospores of *Pythium* sp., whereas in 1927 *Phoma betae* predominated in the cultures from 250 plants. *Pythium* sp. occurred chiefly on the seeds destroyed in the soil before emergence, *Phoma betae* being rare at this stage. Physiological injury to beets in the incipient phases of vegetation induced similar symptoms to those caused by fungi, while the effects of root rot were further simulated by plants exposed in sterile cultures to adverse external conditions. In such cases the root tips are chiefly affected, but in older plants the hypocotyl and adjacent basal parts may also be involved.

Taubenhaus (J. J.) & Ezekiel (W. N.). **Alkali scorch of Bermuda Onions.**—*Amer. Journ. of Botany*, xxi, 2, pp. 69–71, 1 fig., 1934.

Appreciable losses have resulted during the shipping and storage of Texas-grown, white Bermuda onions from a condition termed 'alkali scorch', apparently associated with the heavy impregnation of the jute packing sacks with alkaline materials. The trouble was experimentally reproduced by placing sound onion bulbs in such sacks. Affected onions may be recognized by the irregular, brown to dark reddish spots on the outer scales, superficial at first but gradually penetrating the tissues and ultimately involving the entire bulb in desiccation and mummification.

Waksman (S. A.) & Reneger (C. A.). **Artificial manure for Mushroom production.**—*Mycologia*, xxvi, 1, pp. 38–45, 1 graph, 1934.

An ideal mixture for the preparation of a mushroom [*Psalliota campestris*] compost was shown by the writers' investigations at the New Jersey Agricultural Experiment Station [*R.A.M.*, xii, p. 137] to be furnished by a certain balance between cereal straw and green plant material either freshly harvested or dried. The spawn made the best growth in a small-scale experiment on a mixture of 60 per cent. straw and 40 per cent. dry lucerne hay, the compost being properly watered and allowed to decompose for 44 days, while the largest yield was obtained on 70 per cent. straw plus 30 per cent. tobacco stems similarly treated. Both these artificial composts were superior to the commonly-used horse manure as mushroom bed material, when made into beds and kept at 61° C. for a week before sowing the spawn.

Martinoff (S. I.). Мозайка или втърничване на Лозата (Предварително съобщение). [Mosaic or Reisigkrankheit of the Vine. (Preliminary communication).]—Reprinted from *Земледълие* (*Agriculture*), Sofia, xxxviii, 2, 6 pp., 1934. [English summary.]

As a result of his official investigation in 1932–3 in various parts

of Bulgaria of a serious disease of the vine (first prominent in 1930 and now spreading in a threatening fashion and causing considerable losses in young plantations), the author states that the trouble is a virus disease, apparently closely related to vine mosaic in Czecho-Slovakia [*R.A.M.*, xiii, p. 421]. Careful examination of affected vineyards showed the presence in the same field and not infrequently on the same stock of various combinations of different symptoms characteristic of diseases which have been described in literature under the names of mal nero [ibid., ix, p. 504], reisigkrankheit, roncet, court-noué [ibid., xiii, pp. 353, 422], rougeau, brunissure, apoplexie [cf. ibid., x, p. 78], &c., and which the author considers to be but different manifestations of the virus trouble, either due to varietal responses of the host or to ecological conditions. The diversity of the symptoms [which are briefly described as affecting the various organs] would indicate, however, the probability that the virus is not a single entity but a mixture of more than one component.

From a study of the relevant literature, the author concludes that the disease is very widely distributed over the whole world, and that it is readily transmissible by cuttings, grafts, pruning tools, and the like, and probably also by insects, among which the possibility of the two forms of *Phylloxera* [*P. vastatrix* f. *gallicola* and f. *radicicola*) acting as vectors is not excluded. He considers that a very large proportion of the existing vine stocks are infected, the problem being complicated by the fact that some varieties appear to carry the virus in a latent condition. In his opinion the disease calls for control measures planned on the same lines as those for the control of virus diseases of potatoes or sugarcane.

MARCHAL (É). **Observations et recherches effectués à la Station de Phytopathologie de l'Etat pendant l'année 1933.** (Observations and researches carried out at the State Phytopathological Station during the year 1933.]—*Bull. Inst. Agron. et des Stat. de Recherches de Gembloux*, iii, 2, pp. 97–106, 1934. [Flemish, German, and English summaries.]

This report contains *inter alia* the following items of interest. In 1933, sugar beets in Belgium were widely and severely attacked by mosaic [*R.A.M.*, xii, pp. 263, 673], while mangolds suffered heavy losses, especially in the late crop. The bacterial disease of tobacco resembling wildfire [*Bacterium tabacum*: ibid., xiii, p. 190] was less prevalent than in previous years, though tobacco mosaic was commoner; a few isolated cases of vein-banding and ring spot were noted. Onions were attacked by *Urocystis cepulae*. Witloof chicory [*Cichorium intybus*] showed a bacterial root rot thought to be due possibly to *Bacillus carotovorus*. Beans [*Vicia faba*] developed a bacteriosis resembling chocolate spot (*B. lathyri*) [ibid., xiii, p. 206]. La Hestre dahlias were attacked by mosaic [see below, p. 516] and ring spot [ibid., xii, p. 697], while lilies were affected by a bacteriosis characterized by brown, slightly depressed spots on the leaves and dark striae on the axes, the symptoms closely resembling those of *B. lilii* Uyeda.

**England and Wales: new and interesting phytopathological records for the year 1933.**—*Internat. Bull. of Plant Protect.*, viii, 3, p. 51, 1934.

The following fungi are believed to have occurred for the first time on the hosts in question in England and Wales during 1933: *Phytophthora cryptogea* [*R.A.M.*, ix, pp. 272, 700] causing foot rot of *Zinnia* [*elegans*]; *Pleospora herbarum* and *Marssonina panattoniana* [ibid., ix, p. 224] on endive; *Helicobasidium purpureum* on chicory; *Septoria gladioli* [ibid., xiii, p. 461] on imported crocus corms; *Thielaviopsis basicola* on *Gloxinia* [*speciosa*] corms; and *Sclerotium tuliparum* [ibid., xi, p. 423] on *Narcissus* bulbs.

Christoff (A.). Нѣколко нови растителни болести за България. II-и Приносъ). [Some plant diseases new to Bulgaria. (2nd contribution).]—*Bull. Soc. Bot. de Bulgarie*, vi, pp. 37–48, 1934. [English summary.]

In this second list of new records for Bulgaria of plant parasitic bacteria and fungi [*R.A.M.*, xi, p. 475], the author gives notes on 22 species of fungi and two of bacteria, including *Phytomonas* [*Bacterium*] *rhizogenes* [ibid., xiii, p. 450] which he isolated from typical hairy root of apple in the State nursery at Kazanlyk. *Diaporthe perniciosa* [see below, pp. 524, 525] was found causing a trunk rot on cherry trees in the neighbourhood of Varna, and was also isolated from the discoloured wood of plums in Vidin. *Stereum purpureum* was found attacking apples, almonds, pears, bird cherries (*Prunus avium*), and a few plums in several localities. *Puccinia tulipae* Schroeter was seen on *Tulipa orientalis* var. *rhodopea*, producing elongated, erumpent, black sori. The teleutospores are brown, one-septate, warty, and 37 to 48 by 27·7 to 35·3 $\mu$ in diameter. *Phyllosticta* [*Sphaceloma*] *rosarum* [ibid., xii, p. 96] was found on various rose varieties. *Ascochyta piricola* Sacc. was isolated from an apple cutting from a tree affected with a trunk rot. *Hendersonia piricola* [ibid., vii, p. 700] was found on pear. *Pestalozzia malorum* Elenk. & Ohl. occurs frequently on apple seedlings and cuttings; it only differs in the size of its spores (17·5 to 23 by 6 to 7·5 $\mu$) from the description given in the Russian journal, *Plant Diseases*, in 1912 (pp. 94–100), where it was stated to cause a leaf spot of apples. *Fusarium scirpi* var. *caudatum* was observed on the opium poppy (*Papaver somniferum*) in the neighbourhood of Sofia; observations and experimental data indicate that the fungus is a semi-parasite, capable of attacking all the aerial organs of the poppy, including the seed capsules and the seed. Seedlings raised from infected seed suffer severely from a blight caused by the fungus, which was re-isolated from the killed plants. The fungus was cultured on different media, and an account is given of its cultural and morphological characters.

The paper terminates with an annotated list of 28 species of fungi which were found on new hosts in Bulgaria.

Uppal (B. N.). **Appendix K. Summary of work done under the Plant Pathologist to Government, Bombay Presidency, Poona, for the year 1932-33.**—*Ann. Rept. Dept. of Agric. Bombay Presidency for the year 1932-33*, pp. 171–175, 1934.

During the period under review mildew [*Erysiphe polygoni*:

*R.A.M.*, xii, p. 393] of cumin [*Cuminum cyminum*] in one locality in the Bombay Presidency was completely controlled by the application of 20 lb. of sulphur per acre.

Definite proof was obtained that one application of sulphur (20 lb. per acre) made about flowering time, i.e. 40 to 45 days after sowing, effects complete control of powdery mildew of peas [*E. polygoni*: ibid., xii, p. 551]; it was demonstrated experimentally that the fungus lives from year to year as dormant mycelium in diseased seed. The optimum temperature for the germination of the conidia lies between 22° and 24° C., conidial germination not taking place above 30° or below 10°.

Inoculation experiments confirmed the view that the *Alternaria* causing cumin blight [loc. cit.] is confined to this host. The spores are dark brown, stout, often arranged in chains of 2 to 6, and measure 13 to 62 by 6·9 to 24 $\mu$. They have 1 to 8 (usually 3) longitudinal septa, and 1 to 5 (usually 1 or 2) transverse ones.

Copodust [ibid., xii, p. 325] applied every month or two at 15 lb. per treatment per acre gave very promising results in the control of fig rust [*Cerotelium fici*: loc. cit.], while in another locality complete control was secured by five applications of sulphur each of about 24 lb. per acre.

*Macrophomina phaseoli* was isolated from sorghum, papaw, castor, eggplant, and bananas. The fungus produced pycnidia on sorghum seedlings grown in Roux tubes; when the papaw strain was grown on potato dextrose agar pycnidia also developed.

SHEPHERD (E. F. S.). **Botanical Division.**—*Ann. Rept. Mauritius Dept. of Agric. for 1932*, pp. 32–38, 1933. [Received May, 1934.]

In a test carried out in Mauritius to ascertain whether susceptibility or resistance to gummosis (*Bacterium vascularum*) [*R.A.M.*, xii, p. 553] is transmitted to the progeny by certain sugar-cane crosses there was on the whole no consistency in resistance among the progeny of any particular cross of noble canes, but in the progeny of crosses where wild 'blood' [ibid., xi, p. 266; xii, p. 787] had been introduced there was a consistently high resistance; of 16 different seedlings bred prior to 1931 six were highly resistant to immune.

Fifteen months after a plot had been laid out with apparently healthy cuttings of the susceptible P.O.J. 2878 cane taken from a field heavily infected with 'fourth disease' [ibid., xiii, p. 325] no symptoms had appeared on the shoots, nor did they develop in shoots inoculated with a suspension of diseased leaf tissue in water.

A *Pythium* isolated from the roots of sugar-cane seedlings was identified at the Imperial Mycological Institute as, probably, *P. graminicolum* Subram. [ibid., xii, p. 246], apparently identical with Carpenter's cane root *Pythium* in Hawaii. A *Moniliopsis* isolated from the roots of sugar-cane seedlings showed the hyphal characters of strains of the *Corticium solani* group, but no tendency to form sclerotia and no dark coloration.

The chief cause of loss in tobacco was black shank due to a strain of *Phytophthora parasitica* [ibid., xii, p. 554]; in the summer crop loss was reduced by abandoning the practice of apply-

ing pen manure to tobacco nursery beds and fields. A *Phytophthora* associated with a collar rot of *Antirrhinum* sp. was identified by Ashby as a strain of *P. parasitica*, as was another causing a fruit rot of *Luffa acutangula*.

A fungus isolated from a coco-nut tree affected with bud rot was identified, also by Ashby, as a typical strain of *P. palmivora* in the rubber group; it belongs to the same group as the coco-nut *Phytophthora* strains in Jamaica, Porto Rico, and the Philippines [ibid., viii, p. 527].

From a disease of maize characterized by a white striping of the leaves and gum exudation from the stem a pathogenic bacterium was isolated differing from all pathogens hitherto described from maize.

A wilt of zinnias and dahlias was apparently due to *Bacterium solanacearum*; the exudate from the roots of affected zinnias when inoculated into young tobacco plants killed them.

**Plant pathology.** [*ex* Experiment Station Summary Report of Progress, 1933.]—*Maine Agric. Exper. Stat. Bull.* 369, pp. 558–581, 3 figs., 1933. [Received May, 1934.]

In the part of this report dealing with degeneration diseases of Green Mountain potatoes it is stated that the reduction in yield due to these in north-eastern Maine in 1932 ranged from 12 per cent. in the case of mild mosaic to 92 per cent. in that of leaf roll [*R.A.M.*, xii, p. 612]. In the vicinity of Presque Isle rugose mosaic, spindle tuber, and leaf roll spread much less readily than mild mosaic; healthy Green Mountain potatoes grown in 1932 next to others affected with mild mosaic showed 46 per cent. disease when grown in 1933, and even those 14 rows (40 ft.) away gave 12 per cent., whereas healthy rows adjacent to potatoes affected with rugose mosaic developed only 12 per cent. disease in the progeny a year later. In 1932 spindle tuber did not spread beyond the first row, in which only 7 per cent. of the plants became attacked. Mild mosaic (manifested on Green Mountain potatoes as irregular, light green spots, and slight wrinkling) was ascertained to consist of two components, one latent and masked in the Green Mountain and many other varieties, the other manifested on a seedling potato resistant to the former and on a latent-free Green Mountain seedling as light green, slightly rugose leaves. The second component was separated from the latent component by means of aphids, which transmitted the former only.

*Phoma tuberosa* [ibid., vii, p. 425], *Alternaria solani*, and a *Fusarium* were isolated from lesions in stored potatoes, all three being present on most of the samples, indicating that their distribution is general. Both the foliage and tubers of Foster Seedling potatoes were highly resistant to late blight [*Phytophthora infestans*]. The number of growers in Aroostook County co-operating in the potato spray service [mainly against late blight] increased from 81 in 1931 to 2,410 in 1933.

Notes are also given on comparative tests [against potato late blight] with Bordeaux mixture and home-made colloidal copper, as well as home-made and commercial copper-lime and other dusts; and on seed-potato steeping experiments against *Rhizoctonia*

[*Corticium solani*] in which the standard mercuric chloride treatment was compared with acid mercuric chloride, various modifications of it, and with mixtures containing mercuric chloride and potassium iodide. The acid mercuric chloride gives good results but sometimes causes pitting of the eyes. In spraying tests on McIntosh apples lime-sulphur reduced scab [*Venturia inaequalis*] but caused leaf-burn, while lead arsenate applied after the calyx application increased leaf-burn considerably. Slight but significant increases in scab occurred when sulphur dust was substituted for lime-sulphur and when applications of the latter were discontinued after the calyx application.

The most prevalent and destructive disease of blueberries [*Vaccinium* spp.] was mildew [*Microsphaera alni* var. *vaccinii*: ibid., x, p. 532]. Low-bush blueberries (chiefly *V. pennsylvanicum*) affected with witches' broom rust [*Calyptospora columnaris*: loc. cit.] averaged 33 per cent. less yield than healthy ones.

OSMUN (A. V.). **Department of Botany.**—*Ann. Rept. Massachusetts Agric. Exper. Stat. for the year ending November 30, 1933* (*Bull.* 305), pp. 17–22, 1934.

The following items of phytopathological interest occur in this report, to which W. L. Doran and E. F. Guba contribute. Soil in which cucumbers were growing (in crocks) was watered with solutions of copper sulphate at concentrations from 0·29 to 1 gm. per gall. frequently enough to keep the soil at or near the optimum moisture content for growth, from 30th June, when the plants were ten days old, to 11th September, inoculations with *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* [*R.A.M.*, xii, p. 493] being made on 3rd September. None of the treatments increased resistance and all were injurious to growth.

Soil 3 in. deep in flats in which lettuce seedlings were growing was similarly watered with copper sulphate solution at 0·43, 0·57, 0·86, and 1 gm. per gall. One month after the beginning of the treatment, all the plants were inoculated with *Bremia lactucae* [ibid., xii, p. 494]. Tipburn [ibid., xii, pp. 196, 611] was severe on the lettuces given water only, but absent from those treated with copper sulphate, which also showed less downy mildew than the controls. Where 1 per cent. copper sulphate was given there was very little downy mildew, but the lettuces were much injured; the weaker solutions also caused some injury. The protection against the disease did not persist when the plants were planted out in the field.

The red currant tomato (*Lycopersicum pimpinellifolium*) [ibid., xii, p. 120], which is immune from leaf mould (*Cladosporium fulvum*) [ibid., xii, pp. 249, 251], was successfully hybridized with the Success, Belmont, and Break o' Day cultivated varieties. Of tomato crosses grown in the field the following showed most resistance to leaf mould in the $F_2$ generation: Bewley II (Stonnor's M.P. × Up-to-Date) with Norduke, Bewley IV (E.S. 1 × Up-to-Date) with Norduke, Bewley I (Riverside × Up-to-Date) with Norduke, Norduke with Stirling Castle, Up-to-Date with Norduke, and Maincrop with Norduke. Very good control of leaf mould was given by a spray consisting of 1 oz. salicylanilide paste

(shirlan HB) and 2½ oz. sulphonated oil spreader (agral I) [ibid., xii, p. 403]. The Sulphurator patent sulphur-vaporizer [ibid., xii, p. 733], after certain improvements, gave promise of replacing other methods of applying sulphur under glass.

Strawberry gold leaf [ibid., xii, p. 494; xiii, p. 41] did not spread from diseased to healthy adjacent rows. Vertical unions of the root crown of diseased and healthy stock did not result in spread to the healthy half or its daughter plants in the first cropping season.

Most of the damping-off of herbaceous ornamental plants observed was caused by species of *Pythium*, though *Rhizoctonia* was occasionally present. Soil applications of ammonium hydroxide (applied in water two weeks before seeding at the rate of 2 qts. per sq. ft.) 1 in 60, 1 in 50, 1 in 40, and 1 in 30 gave, respectively, no control and no injury to the plants, fair control and no injury, good control but with injury to *Alyssum saxatile* and *Lobularia maritima*, and good control but toxic effect on *A. saxatile*, *L. maritima*, sweet pea, *Scabiosa atropurpurea*, beet, and cucumber. Calcium cyanamide at the rate of 10 gm. per sq. ft. gave good control, benefited *Salpiglossis* and *Campanula medium*, and was harmless to *Calendula*, sweet pea, and *L. maritima*; used at 14 gm. per sq. ft. it gave good control, was harmless to *A. rostratum*, beet, and cucumber, but was toxic to *Scabiosa*.

Ocean Spray, My Love, Satellite Woburn, and Golden Wonder carnations were resistant to blight (*Alternaria dianthi*) [ibid., xi, p. 497].

Bouriquet (G.). **Rapport phytopathologique sur un voyage d'études effectué à la Réunion en octobre 1932.** [Phytopathological report on a voyage of investigation made to Réunion in October, 1932.]—*Rev. Agric. de l'Île de la Réunion*, N.S., xxxix, pp. 11–20, 2 pl., 1934.

These notes on plant diseases observed during a brief visit to Réunion in 1932 contain various items of phytopathological interest, most of which have already been noticed from another source [*R.A.M.*, xii, p. 680].

Arnaudi (C.) & Venturelli (G.). **L'azione del radio sui tumori vegetali.** [The action of radium on plant tumours.]—*Riv. di Biol.*, xvi, 1, pp. 61–79, 1 pl., 1934.

Full details are given of irradiation experiments on *Ricinus communis* plants inoculated with *Bacterium tumefaciens*, which clearly demonstrated the therapeutic effects both of radio-activated water containing 1,600 units Mache of emanations equivalent to 640 microcuries, and of direct exposure to radium filtration through 5 mm. of lead and 1·5 cm. of Columbia paste [cf. *R.A.M.*, xii, p. 680].

Gosset (A.), Magrou (J.), & Tchakirian (A.). **Action de divers éléments sur les tumeurs bactériennes du Pelargonium.** [The action of various elements on the bacterial tumours of *Pelargonium*.]—*Comptes rendus Acad. des Sciences*, cxcviii, 12, pp. 1097–1100, 1934.

Germanium oxide, molybdenic acid, cerium borate and oxide,

stannous and zirconium tartrates, and aluminium chloride, introduced in appropriate concentrations into the galls on *Pelargonium zonale* caused by *Bacterium tumefaciens* [*R.A.M.*, xiii, p. 16], induced the rapid and sometimes permanent necrosis of the neoplasms. The only one of these elements exercising a selective action on the galls when injected into the vascular system of the plants was germanium, the oxide of which produced temporary necrosis in a few days.

KOSTOFF (D.) & KENDALL (J.). **Studies on plant tumors and polyploidy produced by bacteria and other agents.**—*Arch. für Mikrobiol.*, iv, 4, pp. 487–508, 15 figs., 1933.

Following up previous studies [*R.A.M.*, xii, p. 59], the writers present comparative morphological, histological, cytological, and physiological observations on the tumours caused by inoculation with *Bacterium tumefaciens* on *Ricinus communis*, *Pelargonium zonale*, tomato, beet, and tobacco (*Nicotiana triplex* and *N. tabacum* × *N. glauca*), spontaneous outgrowths on various tobacco hybrids, and neoplasms induced by the application of certain chemicals (lactic, formic, and amber acids, asparagin, zinc nitrate, ammonium carbonate, arsenic oxide, urea, formalin, and uranium oxide), *Ricinus* extract, aniline water, and tar water [ibid., x, pp. 200, 393]. Close structural parallels were found to exist between the three types of proliferation. The production of polypoid shoots under the influence of *Bact. tumefaciens* suggests a potentially significant rôle for this widespread organism in the evolutionary process.

A bibliography of 50 titles is appended.

GREANEY (F. J.). **Studies in cereal diseases. XI. The prevention of cereal rusts by the use of fungicidal dusts.**—*Canada Dept. of Agric. Bull.* 171, N.S., 90 pp., 23 figs., 7 graphs, 1934.

Studies [which are fully described and the results of which are tabulated and expressed graphically] at the Dominion Rust Research Laboratory, Winnipeg, of the action of fungicidal dusts on the aecidiospores of *Puccinia graminis tritici* and *P. graminis agrostidis*, and the uredospores of *P. graminis tritici*, *P. graminis avenae*, *P. triticina*, *P. coronata avenae* [*P. lolii*], *P. anomala*, and *P. glumarum* [*R.A.M.*, xi, p. 286; xii, pp. 271, 426] demonstrated that both copper and sulphur dusts were highly toxic to the germinating spores. When tested on the growing plant in the greenhouse, however, sulphur dusts were much more effective than copper dusts, which injured the plants when applied in the quantities necessary for efficient control. The sulphur dusts acted as protective agents, preventing infection when applied before inoculation; their effectiveness was, however, reduced in proportion to the time that elapsed between application and inoculation. Once a plant was infected, subsequent applications of sulphur served only to prevent further infections. The presence of abundant moisture at or after the time of inoculation greatly reduced the efficiency of the sulphur.

In field experiments conducted each year well-timed, properly made applications of sulphur dust prevented rust and other leaf

and stem diseases of cereals, including *Gibberella saubinetii* and bacterial black chaff (not positively identified with *Bacterium translucens* var. *undulosum* [ibid., xii, pp. 7, 13] but identical with it in general symptoms) to a marked degree, practical and effective dusting schedules being drawn up against *P. graminis* on wheat and oats for use in small plots and large fields. Aeroplane dusting [ibid., xi, p. 287] was effective but uneconomic. Taking the tests as a whole, finely divided sulphur gave the best rust control, fungicidal efficacy increasing in proportion to the fineness of the particles; ordinary pure sulphur of 300-mesh fineness gave very satisfactory results. The best control was obtained when the initial applications were made when stem rust first appeared, i.e., when the wheat was in the late 'boot' or 'early heading' stage. Subsequent applications were made over a period of four to six weeks, while the plants remained in a susceptible stage of growth. The most advantageous times were early morning, late evening, and immediately after rain. The effect of the sulphur on the amount of infection and yield was greatest with heavy, frequent applications, and least with light, infrequent ones. For black rust of wheat and oats the most economical rate was 30 lb. per acre per application. When infection was severe the most satisfactory interval between the applications was four days, but when light infection prevailed control resulted from applications made at seven-day intervals at the rate of 15 lb. per acre. Relatively light applications at close intervals gave the best results in preventing leaf rust (*P. triticina*) and some of the minor leaf and stem diseases of wheat and also *P. lolii* on oats. Heavy soil applications of sulphur had no apparent fertilizing effect.

Data presented in the form of correlation coefficients and regression equations show that uniform increases in rust resulted in uniform reduction in yield; at Winnipeg in 1930 each 10 per cent. increment of wheat black rust reduced the yield by 8·2 per cent. Calculated on this basis the total loss in yield that year for black rust of wheat and oats, respectively, was 73 and 49 per cent.

A bibliography of 107 titles is appended.

MEHTA (K. C.). **Rusts of Wheat and Barley in India. A study of their annual recurrence, life-histories and physiologic forms.**—*Indian Journ. Agric. Sci.*, iii, 6, pp. 939–962, 1 pl., 1 map, 1933. [Received June, 1934.]

A report, supplemented by some general observations, tables, and charts, is given of the progress since 1930 of investigations on various aspects of the problems connected with black rust of wheat and barley (*Puccinia graminis*), brown rust of wheat (*P. triticina*), and yellow rust of barley (*P. glumarum*) in India [*R.A.M.*, x, p. 710].

*Berberis vulgaris*, raised from seed collected in England, was successfully infected by black rust sporidia in India, and the resulting aecidiospores infected wheat and barley. The uredospores of *P. graminis* and of *P. triticina*, which are probably disseminated to the plains from relatively low altitudes, cause outbreaks of rust on the new crops fairly early in the season (November and December). Both have recently been found to pass the summer at

altitudes of 3,500 to 4,000 ft. in the Kumaon Himalaya. Hitherto only four physiologic forms of *P. graminis* (XV, XL, XLI, and LXXV) and two of *P. triticina* (X and a new one) [ibid., xii, pp. 556, 619, *et passim*] have been found in India.

Dodoff (D. N.). Физиологически раси на черната ръжда по Пшеницата (**P. graminis tritici**) въ България. (**I** Приносъ). [Physiologic forms of the Wheat stem rust (*P. graminis tritici*) in Bulgaria. (1st Contribution).]—*Yearbook Univ. of Sofia, Fac. of Agric.*, xii, pp. 334–365, 7 figs., 1934. [English summary.]

As a result of his study [details of which are given] of the behaviour on Stakman's and Levine's differential wheat varieties [*R.A.M.*, ii, p. 158] of 69 collections of wheat stem [black] rust (*Puccinia graminis tritici*), gathered in 1931 and 1932 from various parts of Bulgaria, the author established the occurrence in that country of physiologic forms 17, 24, 34, 40, 116, and 119 of the rust. He also found two new forms, 129 and 130, the reaction of which on the differential varieties is indicated, and each of which was obtained only once. It is pointed out that this is the first record in nature of physiologic forms 116 [but see ibid., xiii, p. 361] and 119, which had been artificially produced by crossing in Canada [ibid., x, p. 16; xii, p. 14]. Of these, form 116 was prevalent, together with form 40, both in 1931 and in 1932, while form 119, as well as forms 17 and 24, were only found once each. Form 34 was isolated once in 1931 and six times in 1932. Notes are given on the distribution of these forms in other continents.

In describing the experiments, it is stated that most of the work was done in the months from September to November, inclusive, and from February to the beginning of May, in order to obviate the unfavourable effect of ecological factors, especially that of temperature and light, on the normal development of the artificially induced rust epidemics.

Johnson (T.), Newton (Margaret), & Brown (A. M.). **Further studies of the inheritance of spore colour and pathogenicity in crosses between physiologic forms of Puccinia graminis tritici.**—*Scient. Agric.*, xiv, 7, pp. 360–373, 4 diags., 1934.

Continuing their investigation of the inheritance of colour and pathogenicity in crosses between physiologic forms of *Puccinia graminis tritici* [*R.A.M.*, x, p. 169], the authors give a detailed account of experiments in which they studied this inheritance in a number of selfed $F_1$ hybrid forms, and the $F_2$ cultures from them, of crosses between physiologic forms of the rust. The results [some of which are presented in the form of diagrams] showed the presence in the $F_2$ progeny of a selfed $F_1$ hybrid form, owing to segregation and subsequent recombination of the factors governing pathogenicity, of several different physiologic forms, frequently including the original parental forms. The fact that the number of such physiologic forms in the $F_2$ population was definitely greater in some crosses than in others would indicate that the same number of factors is not involved in all the crosses. It was further shown that the majority of the $F_2$ cultures of the several crosses

that were selfed in the $F_1$ were heterozygous for pathogenicity, and that the progeny of these $F_2$ heterozygous cultures usually contained fewer physiologic forms than that of a selfed $F_1$ hybrid form.

The assumption that the inheritance of pathogenicity in *P. g. tritici* is influenced by the cytoplasm of the parent forms found apparent support in the fact that the pathogenic differences noticed in a previous communication [ibid., xii, p. 14] between $F_1$ hybrid forms originating from opposite sides of reciprocal crosses persisted in all the individuals of the $F_2$ and $F_3$ generations, indicating that these differences are not subject to segregation and recombination as are other pathogenic characters in the same crosses.

While the inheritance of uredospore colour has not been finally studied, the indications are that it is Mendelian in character. The factors for orange and greyish-brown are, in a sense, complementary factors, and the inheritance appears to be analogous to the well-known 'rose and pea comb' type of inheritance in fowls. Red spore colour appears to be due to the presence of two dominant factors for orange and greyish-brown, while white spore colour may be explained by the presence of their recessive allelomorphs.

KLEMM (M.). **Ernteschäden durch Schwarzrost in Deutschland im Jahre 1932.** [Crop damage from black rust in Germany in the year 1932.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiv, 2, pp. 9–11, 1 map, 1934.

Among the German provinces most seriously affected by the 1932 epidemic of black rust of cereals [*Puccinia graminis*: *R.A.M.*, xii, p. 149] were East Prussia and Silesia. The total loss from this source in the former province was estimated by the Königsberg plant protection head-quarters at M. 18,200,000, while in West Prussia, where a record harvest was expected, the wheat and oats yields amounted to only 30 to 60 per cent. of the normal; in the Pillkallen district alone the losses approximated to M. 4,250,000. In Lower Silesia severe damage from rust occurred over an area of 34,000 hect., and in two districts the yields were reduced by 40 to 50 per cent., these being the heaviest losses on record for some thirty years.

NEILL (J. C.). **The control of stinking smut of Wheat. Experiments on seed treatment with various dusts.**—*New Zealand Journ. of Agric.*, xlviii, 3, pp. 170–171, 1934.

The results [given in a table] of experiments in 1933 at the Plant Research Station, Palmerston North, for the purpose of comparing the relative efficacy of a number of fungicidal dusts in the control of wheat bunt [*Tilletia caries* and *T. foetens*] by seed-grain treatment, showed that ceresan new alone completely controlled the disease in the progeny of naturally heavily infected (56 per cent. smutted plants) Solid Straw Tuscan wheat, ceresan being nearly as effective. Among the copper compounds tested, smutol (copper oxychloride) [*R.A.M.*, x, p. 781] gave the best results, followed closely by copper carbonate; various samples of the latter were effective in the order of their relative copper contents. In the progeny of the artificially infected Jumbuck wheat (25 per

cent. smutted), bunt was entirely controlled by all the dusts, with the exception of agrosan G, semesan, and the copper carbonate with the lowest copper content (18 per cent.).

NEILL (J. C.). **Effect of excess of disinfectant dusts on the field germination of seed Wheat.**—*New Zealand Journ. of Agric.*, xlviii, 3, p. 174, 1934.

The experiments briefly outlined in this note showed that copper carbonate or agrosan G dust in excess of the dose prescribed for wheat seed-grain disinfection [e.g., against *Tilletia caries* and *T. foetens*: see preceding abstract] had little or no effect on germination in the field, whether sown with or without superphosphate. Excess ceresan practically inhibited germination of the wheat under the same conditions, while ceresan new in excess caused severe injury in the absence of the fertilizer but gave slightly better germination than untreated seed when sown with superphosphate.

RUSSELL (R. C.). **Studies in cereal diseases. X. Studies of take-all and its causal organism, Ophiobolus graminis Sacc.**—*Canada Dept. of Agric. Bull.* 170, N.S., 64 pp., 18 figs., 1934.

In this detailed account of his investigations into take-all of wheat (*Ophiobolus graminis*) [*R.A.M.*, xii, pp. 621, 684; xiii, p. 433] in western Canada the author states that penetration of the epidermal cells of the coleoptile appears to be largely mechanical, although the staining reaction of the host cell wall is changed round the point of entry, possibly through the action of an enzyme or toxin secreted by the fungus. Near the points of penetration the cell walls usually swell, producing the 'lignitubers' of Fellows [ibid., viii, p. 370], the penetration pegs formed at the tips of the hyphal branches being only about one-fifth of the diameter of the external hyphae. When the hypha has entered an epidermal cell it often turns at right angles and branches. The fungus then passes into the cortex, apparently destroying the parenchymatous tissue much sooner than the fibrovascular. Infection appears to be limited to the underground parts and the base of the stem for a short distance above the ground.

Host range studies showed that most of the cereals and cultivated grasses as well as many wild grasses in western Canada are susceptible, but oats, maize, and all plants other than Gramineae tested were highly resistant; one hundred wheat varieties belonging to eight subspecies of *Triticum* were all about equally susceptible. *O. graminis* exists as a grass parasite in the native sod.

The fungus remained viable in pots kept free from vegetation for one year in the greenhouse and for two years out of doors, subsequently infecting wheat sown in this soil.

Different isolates of *O. graminis* varied greatly in their pathogenicity to wheat, some varying markedly at different periods though the cause of this was not ascertained.

Heavy infection of artificially inoculated wheat seedlings was favoured as a rule by a relatively low soil moisture content (35 to 40 per cent. saturation) [ibid., xi, p. 291] and a relatively high temperature (22° C.), but the fungus was very actively parasitic

over a somewhat wide range of soil moisture and temperature conditions.

Under the conditions prevailing in western Canada the best means of controlling take-all consists in crop rotation, in which summer fallow and highly resistant crops such as oats, maize, flax, sunflower, peas, &c., are alternated with wheat.

Sanford (G. B.) & Broadfoot (W. C.). **On the prevalence of pathogenic forms of Helminthosporium sativum and Fusarium culmorum in the soil of Wheat fields and its relation to the root rot problem.**—*Canadian Journ. of Res.*, x, 3, pp. 264–274, 1 graph, 1934.

An attempt was made to determine the relative virulence, on Marquis wheat seedlings and mature plants in the greenhouse at soil temperatures ranging from 13° to 21° C., of 227 collections of *Helminthosporium sativum* and 286 of *Fusarium* sp. (*culmorum* type) from diseased crown tissue of wheat stubble in five fields in the black soil belt of central Alberta [*R.A.M.*, xii, p. 684]. The plants were grown in open pots in sterilized, artificially inoculated soil, 2,672 pots being used for the *Fusarium* tests on seedlings and 1,164 for those on mature plants, while the corresponding figures for the *H. sativum* experiments were 1,948 and 532, respectively.

In general, the data from these trials [which are tabulated and discussed] indicate only a moderate to weak pathogenicity of *H. sativum* on seedlings and still slighter effects on mature plants, while the *Fusarium* caused little damage to seedlings and practically none on older individuals. There were, however, a few virulent strains of both fungi in the fields under observation. Taking the results as a whole, a much larger proportion of *H. sativum* collections were more injurious to wheat seedlings than the corresponding isolations of the *Fusarium*, some 85 per cent. of which showed a degree of virulence below 20 per cent.; only 30 per cent. of the *H. sativum* collections fell in this group, the remainder being placed in classes up to 90 per cent., with the majority between 20 and 50 per cent.

In view of the great susceptibility of seedlings in sterilized, reinfected soil and the variable results, presumably due to the action of associated soil contaminants in open pot culture, it was concluded that the technique here employed is not adapted to the object of the investigations. The possibility of securing consistent results on mature plants in sterilized, reinfected soil, protected from accidental contamination, is discussed in relation to the root rot problem.

McClelland (C. K.) & Young (V. H.). **Seed Corn treatments in Arkansas.**—*Journ. Amer. Soc. Agron.*, xxvi, 3, pp. 189–195, 1934.

In north-western Arkansas the maize diseases caused by *Diplodia zeae* and *Gibberella saubinetii* are of relatively slight importance, and no assured benefit from seed-grain treatment was derived in four years' trials on the Paymaster variety. Except in 1929, semesan jr. [*R.A.M.*, xi, p. 350] caused a significant reduction or delay in the germination in all early plantings. Stimulatory

effects were exercised by Du Bay 1100 and merko [ibid., ix, p. 521] in 1932. The results obtained with sterocide [ibid., ix, p. 373] were conflicting.

SWANSON (C. O.). **Some factors involved in damage to wheat quality.**—*Cereal Chem.*, xi, 2, pp. 173–199, 1934.

It was shown by experiments [the results of which are fully discussed and tabulated] at the Kansas Agricultural Experiment Station that moulding [fungi unspecified] of stored wheat seed-grain may be prevented by the complete exclusion of air and treatment with ceresan (1 part to 300 of seed-grain). Little development of mould occurred on grain stored in a room at 60° F. or kept outdoors during the winter when the moisture content did not exceed 20 per cent., and none at 18 per cent. or below. Some mould growth occurred on grain stored in a box at 95° or kept in the laboratory during the winter with a moisture content of 14 per cent., the moulding increasing *pari passu* with rising humidity [cf. *R.A.M.*, xii, p. 757]. After some 13 to 16 weeks under conditions of combined high temperature and moisture the damage from moulds was very considerable.

PUTTERILL (V. A.). **Citrus wastage investigations. Progress report no. 2. Season 1933.**—*S. Africa Dept. of Agric. Bull.* 131, 40 pp., 4 figs., 1934.

A detailed account is given of a comprehensive series of experiments carried out in two localities in South Africa in 1933 to estimate the influence exerted by numerous factors on the fungal wastage (nearly all due to *Penicillium digitatum*) [*R.A.M.*, xiii, p. 228] of stored Navel oranges, the points dealt with including the effects of very careful handling and packing, varying the wilting period before packing, distance of transport from orchard to packing-shed; washing in sodium bicarbonate, and tight packing; a test was also made of the keeping quality of puffy and weak-skinned fruits.

The results obtained [which are tabulated and fully discussed], while not regarded as conclusive [cf. ibid., xi, p. 104], are to be used as a basis for further investigations.

BATCHELOR (L. D.) & SCHOONOVER (W.). **Present state of Citrus mottle leaf studies.**—*California Citrograph*, xix, 5, pp. 112, 132, 1934.

The practice of spreading zinc sulphate at the foot of citrus trees in California for the control of mottle leaf [*R.A.M.*, xii, p. 434; xiii, p. 438], having been found highly injurious to the trees, has been discontinued. While a somewhat larger amount spread under the drip of the tree but not against the trunk may prove to be less injurious and ultimately equally beneficial, the author states that excellent results have been obtained by spraying with mixtures containing zinc sulphate, affected trees having in some instances been greatly improved in a few weeks by this method. A formula recommended as reasonably effective and safe for a limited test is 10 lb. zinc sulphate (25 per cent.), 5 lb. hydrated lime, and ¼ lb.

blood albumin spreader in 100 galls. water. The trees should be well covered with the fluid but need not be drenched.

MALENÇON (G.). **Nouvelles observations concernant l'étiologie du bayoud.** [New observations on the etiology of the 'baïoud' disease.]—*Comptes rendus Acad. des Sciences*, cxcviii, 13, pp. 1259–1261, 1934.

A study of *Cylindrophora albedinis*, the causal organism of the 'baïoud' disease of date palms [in Morocco: *R.A.M.*, xii, p. 626], revealed striking variations in the morphology of the conidia, some of which are pluriseptate, straight or slightly curved, with rounded apices, while others are sharply bent with tapering, acute extremities (falcate) and either unicellular or furnished with a single median transverse septum. The sclerotia are actually of a very dark greenish-blue though appearing black at the first glance; they are best developed on Czapek's or Waksman's agar media. These characters, taken in conjunction with others previously recognized, e.g., the pink or purple colour of the cultures and the formation of terminal or intercalary chlamydospores, suggested that *C. albedinis* might be the microconidial stage of a *Fusarium*, and at the beginning of 1933 small, pale pink sporodochia were detected emerging through the bark at the base of a diseased palm and forming on the exterior a velvety, pulverulent, macroconidial layer. Adjacent pustules produced only microconidia. The entire complex of fructifications was more or less covered by a white network of slender mycelial elements bristling with conidiophores bearing the typical microconidia of *C. albedinis*. Monospore cultures of the latter yielded the *Fusarium* macroconidia and vice versa, thereby conclusively proving that the agent of the baïoud disease is a *Fusarium* to which the name of *F. albedinis* (Killian et Maire) Malençon is given. The new species belongs to the *Elegans* section and morphologically resembles *F. vasinfectum*, from which it differs, however, in its mode of entry into the host through wounds and apparently not by way of the soil.

BOURIQUET (G.). **Le Caféier d'Arabie à Madagascar, dans la région du lac Itasy, et l'Hemileia vastatrix.** [Arabian Coffee in Madagascar, in the region of Lake Itasy, and *Hemileia vastatrix*].—*Agron. Colon.*, xxiii, 197, pp. 133–135, 1 pl., 1934.

In a test carried out in an experimental plot of Arabian coffee in Madagascar during the wet season of 1932–3 three applications of a copper spray at a total cost of about 30 centimes per bush gave adequate control of *Hemileia vastatrix* [see next abstract]. Encouraged by the results obtained, all the local European and some of the native growers now spray their coffee, over 58,000 bushes being treated in 1932–3; the condition of the plantations is at present very satisfactory.

BOURIQUET (G.). **Les maladies du Caféier à Madagascar.** [Coffee diseases in Madagascar.]—*Agron. Colon.*, xxiii, 193, pp. 1–10; 194, pp. 42–48; 195, pp. 73–82; 196, pp. 109–118, 4 pl., 1934.

The leaf disease of coffee caused by *Hemileia vastatrix* [*R.A.M.*, xiii, p. 229, and preceding abstract] is stated to have been mainly

responsible for the replacement on the east coast of Madagascar of the highly susceptible *Coffea arabica* by more resistant but less valuable species, the cultivation of the former being now restricted to the highlands of the volcanic Itasy region, where the first commercial plantation was started at the beginning of 1926. At first the bushes developed normally, in spite of slight attacks by *H. vastatrix*, but as they came into full bearing in 1930 they began to suffer to a very considerable extent from the disease. This led the author in October, 1931, to undertake spraying experiments in three different plantations at altitudes varying from about 1,250 to 1,600 m., the results of which showed that the disease is amenable to control with either Burgundy mixture (1·5 kg. copper sulphate, sufficient carbonate of soda to render the mixture slightly alkaline, 375 gm. colophony soap [ibid., xiii, p. 113], and 100 l. water) or Bordeaux mixture (1·5 kg. copper sulphate, sufficient lime to render the mixture slightly alkaline, 1 l. skimmed milk, and 100 l. water), the number of applications varying from three or four at the highest to six or seven at the lowest altitude. The application of stable manure and mineral fertilizers to the coffee bushes did not appear to have any influence on the beneficial effect of the treatment, which resulted in an appreciable increase (varying from 1·76 to 12·50 per cent.) in the production of large-sized coffee beans by the sprayed bushes. Under the local working conditions the maximum cost of spraying is estimated at a total of 0·50 franc per bush per year, which should leave a high margin of profit to the growers, especially since coffee from the treated bushes was found on arrival in France to be of much better quality than that from the controls, and thus to command higher market prices.

Brief notes are given on other fungal and insect diseases of coffee in Madagascar, including a species of *Verticillium* which develops on *H. vastatrix* pustules, possibly parasitizing the latter; *Cercospora coffeicola* [ibid., xii, p. 552], which occasionally is severe on the east coast; anthracnose (*Gloeosporium coffeanum*) [(?) *Glomerella cingulata*: ibid., i, p. 4], which is rare; *Corticium salmonicolor*, chiefly in poorly cultivated plantations; a root rot associated with sterile rhizomorphs very similar in their structure to those of *Armillaria mellea* [ibid., xii, pp. 201, 422, 760]; the root rot associated with an unidentified mycelium and the coccid insect *Lachnodium greeni* [see next abstract]; and a species of *Aschersonia* which was isolated from mummified remains of coccid insects on coffee twigs.

Maublanc (A.) & Roger (L.). **La phthiriose du Caféier.** [Phthiriosis of Coffee.]—*Comptes rendus Acad. des Sciences*, cxcviii, 4, pp. 191–192, 1934.

After referring to the coffee disease caused in Madagascar by a fungus closely resembling *Polyporus coffeae*, in association with a coccid insect [*Lachnodium greeni*: *R.A.M.*, xi, p. 699, and preceding abstract], the authors state that specimens of *P. coffeae* from the Cameroons examined by them showed conidia closely resembling and perhaps identical with those of *Bornetina corium*, the agent of phthiriosis of the vine [ibid., i, p. 117]. That a relationship exists between *P. coffeae* and this conidial form is, however,

improbable; it is more likely that the latter is associated with a *Septobasidium*, as Patouillard has already suggested for *B. corium*.

MAUBLANC (A.) & ROGER (L.). **Une nouvelle rouille du Caféier au Cameroun.** [A new Coffee rust in the Cameroons.]—*Comptes rendus Acad. des Sciences*, cxcviii, 11, pp. 1069–1070, 1934.

A rust, differing widely in the symptoms it causes as well as in its morphology from the widespread coffee rust due to *Hemileia vastatrix* [*R.A.M.*, xii, p. 169], was recently observed on *Coffea arabica* in the Cameroons. It is considered to be an undescribed fungus and is provisionally named *Uredo coffeicola*.

Whereas *H. vastatrix* produces diffuse, discoloured areas, becoming rounded or sinuous by confluence, the new rust completely covers the under side of the leaves with a thick dust of orange uredospores. All the leaves arising from a single branch may be attacked. The mycelium can be distinguished from that of *H. vastatrix* by its sparse, straight, and simple hyphae, which enter the spongy parenchyma perpendicularly without penetrating the palisade tissue; haustoria are specially abundant in the deeper layers of the mesophyll.

In the formation of the uredosori of *U. coffeicola* one or more hyphae grow towards the ostiole of a stoma, forming a series of large vesicles (20 to 30 $\mu$ in diameter), one or more of which push up finger-shaped extensions resembling dense heads of sterigmata and bearing the uredospores either in the stomatal cavity or on the exterior. The uredospores are broadly oval or subtriangular, sometimes slightly reniform, 24 to 32 by 18 to 26 $\mu$, and the epispore is provided with conical, evenly distributed protuberances almost as wide at the base as they are high (3 to 5 $\mu$). They are thus markedly different from the well-known uredospores of *H. vastatrix*.

DASTUR (J. F.). **Cotton anthracnose in the Central Provinces.**—*Indian Journ. Agric. Sci.*, iv, 1, pp. 100–120, 2 pl., 2 figs., 1 graph, 1934.

In 1931 an anthracnose of cotton due to a species of *Colletotrichum* [*R.A.M.*, xii, p. 267] was unusually prevalent in the Central Provinces of India, where it caused considerable damage. Bolls of all sizes may be attacked and in severe cases shedding occurs before maturity. When the boll is infected through the pistillary end the entire boll may be involved; the locks may be split and their contents rotted. The inner boll wall, when involved, assumes a yellow to black discoloration and is often covered with minute, black stromata; the lint hairs in contact with the diseased area are stained yellow or brownish, or clumped into a solid, brittle mass of fibres. The progress of infection is much more rapid in moist than dry weather. The fungus reaches the seed either from the lint or through the placenta, infection in the former case generally being confined to the outer integument, while in the latter the funicle may be penetrated and the embryo invaded. Severely diseased seeds are abnormally light, poorly and

irregularly developed, and of a brownish-yellow colour. Seedling infection may arise from the underground parts or the cotyledons and cause either damping-off or wilting according to the point of attack and the stage of maturity of the plant. The presence of the *Colletotrichum* acervuli on the underground parts of the seedling is the sole conclusive evidence of anthracnose, the symptoms of which at this stage are otherwise liable to confusion with those due to *Pythium aphanidermatum*, *Rhizoctonia bataticola* [*Macrophomina phaseoli*], or *R.* [*Corticium*] *solani* [ibid., x, p. 660].

Hyphae occur abundantly in the outer integument of diseased seeds, penetrating between the cells and sometimes collecting into stromatic masses. The inner integument and embryo are invaded only through the thin-walled, short cells of the funicle in severe attacks. As a rule, badly infected seeds do not germinate, but sometimes the cotyledons emerge and normal leaves develop before the death of the plant from the spread of the fungus to the growing point.

Inoculation experiments with the *Colletotrichum* on the bolls were most successful through punctures or on the suture of two adjoining loculi. Seedlings were infected by placing the inoculum near the collar or on the tap-root below soil level. Flowers and flower buds rapidly contracted infection.

Good results in the control of this disease have been obtained by one hour's immersion of the seed in 0·25 per cent. uspulun, dusting with the same preparation, or delinting with sulphuric acid (1 part to 15 to 20 parts by volume of the seeds).

The digitate, often slightly curved, hyaline conidiophores of the causal organism, broadly rounded at the apex and flat at the base, measure 7·7 to 13·2 by 1·6 to 2·7 $\mu$; from their tips are abstricted a succession of falcate, hyaline conidia, averaging 20 to 22·5 by 2·5 $\mu$, with a range of 15 to 25 by 1·8 to 4·3 $\mu$. The dark brown setae (often paler at the apex and base) measure 76·5 to 125·5 by 3·8 to 7·6 $\mu$. The fungus is considered to be an undescribed species and is provisionally named *C. indicum* Dast.

Field observations indicate that the *Gossypium neglectum verum* types of cotton are most susceptible to anthracnose, Bani (*G. indicum*) being resistant and *G. neglectum roseum* of intermediate reaction.

EZEKIEL (W. N.) & TAUBENHAUS (J. J.). **Variety tests in the differentiation of two Cotton wilts.**—*Phytopath.*, xxiv, 3, pp. 292–295, 1 graph, 1934.

Cotton varieties have been tested in Texas for their reaction to wilt caused by *Fusarium vasinfectum* [*R.A.M.*, xii, p. 42] and to an apparently different wilt temporarily designated 'Waxahachie wilt' from the district in which it was found. The latter disease is marked by a discoloration of the central part of the stems or roots, instead of the darkening of the outer xylem found in *Fusarium* wilt. None of the fungi isolated from cases of the new disease has reproduced it, so that its cause is still obscure. The varieties tested reacted somewhat differently to the two diseases. Thus, both in 1929 and 1930, Rhyne's Cook showed the least infection by *F. vasinfectum* but was only moderately resistant to

Waxahachie wilt. The Watson and Wannamaker-Cleveland selections of Dixie Triumph are both about equally resistant to *Fusarium* wilt but show considerably greater susceptibility to the Waxahachie form.

NICHOLLS (H. M.). **Diseases of adult bees.**—*Tasmanian Journ. of Agric.*, v, 1, pp. 13–17, 3 figs., 1934.

The author states that the wholesale dying-off of adult bees which has recently been reported from several apiaries in Tasmania has been found to be due in part to the well-known microsporidiosis caused by *Nosema apis* (apparently its first record in Tasmania) and in part to infection by *Trichoderma lignorum* [*R.A.M.*, v, p. 300]. In the great majority of the cases investigated the two organisms were found to occur in close association with one another in the chyle-stomach of the dead bees, the walls of which were riddled by the hyphae of *T. lignorum*, and in many cases the outer coating of muscular fibres was detached from the underlying cells by the mycelium. There did not appear to be any definite external symptoms of infection by either organism, apart from the rapid dwindling of the bee colonies, and no external growth developed on dead bees when incubated.

*T. lignorum* was found to be still viable in dead bees kept dry for over a year in the laboratory. One of the main sources of infection appears to be drinking water, especially that in close proximity to infected beehives. The fungus has been found several times in the cells of combs from infected hives, and it is possible that it is introduced into the cells by foraging bees, and can thence infect the whole hive. The paper terminates with a brief consideration of possible means of control of the disease.

HENDEE (ESTHER C.). **The association of the termites, Kalotermes minor, Reticulitermes hesperus, and Zootermopsis angusticollis with fungi.**—*Univ. of California Publ. in Zool.*, xxxix, 5, pp. 111–134, 1 fig., 1933.

This is an extended and fully tabulated account of the writer's researches on the association between certain termites and fungi in various hard- and soft-woods in California, a condensed version of which has already appeared [*R.A.M.*, xii, p. 460].

DRECHSLER (C.). **Organs of capture in some fungi preying on nematodes.**—*Mycologia*, xxvi, 2, pp. 135–144, 1934.

Attention is drawn to some close parallels between Sherbakoff's recently established genus *Anulosporium*, represented by *A. nematogenum* n. sp. [*R.A.M.*, xii, p. 763], and other nematode-capturing fungi, e.g., *Dactylaria candida* (Nees) Sacc. and certain species of *Monacrosporium*, one of which, *M. subtile* Oud., also somewhat resembles a *Fusarium*-like organism found by the writer capturing nematodes in solitary, non-constricting loops [loc. cit.]. The characteristic globose cells of *D. candida*, which manifestly correspond to the 'globular bodies' of *A. nematogenum*, are believed to constitute complete organs of capture, independent of the loops, for smaller prey. Similar loops are formed in the above-mentioned *Fusarium*-like species of *Monacrosporium*. The nature

and functions of the organs of capture in a number of other predacious fungi are fully discussed, with references to the relevant literature.

STEYN (D. G.). **Fungi in relation to health in man and animal.**—*Onderstepoort Journ. Veter. Sci.*, i, 1, pp. 183–212, 1933.

After reviewing the literature on fungi harmful to man and domestic animals, the writer tabulates and discusses the results of experiments on rabbits at Onderstepoort, South Africa, from which it appeared that maize infected by *Diplodia zeae* produced toxic effects on various occasions [cf. *R.A.M.*, xiii, p. 218]. The toxicity of darnel (*Lolium temulentum*) is usually attributed to the infection of the grains by *Endoconidium temulentum* [ibid., vii, p. 88, and next abstract], the active principle of which is an alkaloid, temulin, absent from fungus-free plants, but two rabbits, a pig, and a dog consumed large quantities of infected darnel without ill effects. Rabbits and pigs further failed to react to feeding on cultures of *Fusarium moniliforme* [*Gibberella moniliformis*], *F. moniliforme* var. *subglutinans*, and *G. saubinetii* (*F. graminearum*) [ibid., x, pp. 91, 651], while maize and bran heavily infected with various organisms (including *Rhizopus nigricans* and *F.* sp.) were innocuous to rabbits and fowls. In general horses and pigs seem to be more susceptible to mouldy foodstuffs than ruminants and fowls, the positions being reversed, however, in the case of *D. zeae* on maize.

LEEMAN (A. C.). **A short summary on our botanical knowledge of Lolium temulentum L.**—*Onderstepoort Journ. Veter. Sci.*, i, 1, pp. 213–218, 2 figs., 1933.

A summary is given of the available literature on *Lolium temulentum*, with special reference to the question of the part played by *Endoconidium temulentum* in its toxicity to man and stock [see preceding abstract].

JUNGHERR (E.). **Mycosis in fowl caused by yeast-like fungi.**—*Journ. Amer. Veter. Med. Assoc.*, lxxxiv, 3, pp. 500–506, 4 figs., 1934.

Mycoses of birds are divisible into three main groups, namely, favus due to *Achorion schoenleini* var. *gallinae* [cf. *R.A.M.*, x, p. 243], aspergillosis associated with *Aspergillus fumigatus* [ibid., xiii, p. 371], and 'sour crop' or mucous membrane infections caused by *Monilia* and *Oidium* spp., with which the present investigation (carried out in Connecticut) is concerned. All domesticated birds and game birds reared in captivity are liable to these diseases, especially in wet early summers. Immune carriers of the fungi appear to be uncommon, but there is evidence that the latter may persist for some time in a saprophytic state. The author's observations indicate that they may be introduced to farms and the like through the agency of hatching eggs, presumably on the shell. These yeast-like fungi are resistant to disinfection with common coal-tar derivatives but succumb to iodine in relatively high dilutions [cf. ibid., xii, p. 509]. The two principal organisms implicated in the development of 'sour crop' are *M.* [*Candida*] *albicans* and

*O. pullorum* n. sp., the latter characterized by septate, slightly clavate hyphae, 3·5 $\mu$ in width, elliptical oidia arranged in the necklace form typical of the genus, and chlamydospores. This species, which grows well at 37°C. and is capable of utilizing the glucoside aesculin, was compared with *O.* [*Oospora*] *lactis*, a common contaminant of dairy utensils and sour milk [ibid., xiii, p. 97], and found to differ in various morphological and biological characters. *M.* [*C.*] *krusei* [ibid., xiii, p. 370] is of widespread occurrence in birds, to which, however, it is apparently non-pathogenic.

AGOSTINI (ANGELA). **Miceti della Somalia.** [Mycetes of Somaliland.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, iv, pp. 191–201, 4 figs., 1933. [Latin summary. Received May, 1934.]

Notes are given on 19 fungi associated with human or animal diseases observed in 1932 in Italian Somaliland and including *Coccidioides immitis* [*R.A.M.*, xiii, p. 235], isolated from a cutaneous affection of the leg of a European patient, and *Monacrosporium tedeschi* n. sp., isolated from skin lesions mainly on the legs of four natives suffering from 'avitaminosis' (scorbutic beriberi). In the latter organism the hyaline mycelium bears lateral conidiophores at the tips of which an oblong-elliptical conidium, at first continuous, later 1- to 4-septate, is formed. This rapidly becomes detached owing to the immediate formation of another below it. The conidia, which remained in close proximity to one another, measured 16 to 19 by 4 to 7 $\mu$. As conidial formation ceased or diminished, intercalary chlamydospores and terminal aleuria developed, the latter of which were usually round, verrucose (sometimes smooth), and measured 9·5 by 7 $\mu$. Some of these organs fused in pairs, a 'zygospore' being formed that was able to reproduce the mycelium. A Latin diagnosis is given.

ILDRIM (D.). **Die Dermatomykosen Favus, Trichophytia, und Mikrosporia in Aserbaydshan (Transkaukasus).** [The dermatomycoses favus, trichophytosis, and microsporosis in Azerbaidjan (Transcaucasia).]—*Arch. Schiffs u. Tropenhyg.*, xxxvii, pp. 505–508, 1933. [Abs. in *Zentralbl. für Bakt.*, Ab. 1 (Ref.), cxiii, 17–18, pp. 393–394, 1934.]

Dermatomycotic affections are stated to be widely distributed in Azerbaidjan, Transcaucasia. Among 430 patients, 321 gave cultural evidence of infection by *Achorion schoenleini*, 16 of *Trichophyton gypseum granulosum* [*T. granulosum*], 15 of *Microsporon lanosum*, 12 of *T. cerebriforme*, 11 of *T. faviforme*, 10 of *T. violaceum*, and the remainder were distributed in smaller numbers amongst several species. The predominance of favus is attributed to the refractory character of the trouble, which may persist in a given individual for as long as 35 years and so increase the risks of spreading *A. schoenleini* among the population.

WILLIAMS (J. W.). **Scalp products and hair as a culture medium for certain pathogenic fungi.**—*Proc. Soc. Exper. Biol. and Med.*, xxxi, 5, pp. 586–588, 1934.

Comparative studies were made of the rate of growth of certain fungi pathogenic to the human hair (*a*) on a medium of barber's

shop hair cleansed with water and autoclaved, and (*b*) on Sabouraud's conservation medium.

Nine organisms growing well on the latter substratum failed to develop on the former, viz., *Achorion schoenleini*, *Acladium castellanii* [*R.A.M.*, vii, p. 240], *Candida candida* [*C. vulgaris*], *Endomyces dermatitidis* [ibid., xiii, p. 235], *Epidermophyton inguinale* [*E. floccosum*], *Glenospora gammeli* [loc. cit.], *Microsporon audouini*, *Oospora humi*, and *Willia anomala* [ibid., vii, p. 471]. On a child's hair, however, *M. audouini* developed in seven days [cf. ibid., xiii, p. 96]. On both the hair-water medium and Sabouraud's, growth within four days was made by *Indiella americana* [ibid., ix, p. 782], *Lichtheimia* sp., *Monosporium* [*Scedosporium*] *apiospermum* [loc. cit.], *Scopulariopsis brevicaulis* [*Penicillium brevicaule*: ibid., xiii, pp. 372, 443], *Trichophyton japonicum*, and *T. interdigitale* [*T. mentagrophytes*]. *Geotrichum bachmanni* and *T. granulosum* developed in four days on Sabouraud's medium and in seven on the hair-water substratum, while *Endomyces capsulatus* [ibid., xiii, p. 95], *Monilia* [*C.*] *albicans*, and *T. crateriforme* [ibid., xiii, p. 96] required 20 days for growth to appear on the latter and only four on the former. *Endodermophyton tropicale* [*T. concentricum*: ibid., xi, p. 646], on the other hand, grew in five days on the hair-water medium but required seven on Sabouraud's.

Catanei (A.) & Goinard (P.). **Un nouveau cas algérien de mycétome du pied.** [A fresh Algerian case of mycetoma of the foot.]—*Bull. Soc. Path. Exot.*, xxvii, 2, pp. 176–178, 1 fig., 1934.

From a mycetoma of the foot in Algeria the writers isolated a fungus with abundant ovoid to piriform, globular, or elongated, olive-brown conidia, 7 to 8 by 4 to 5 $\mu$, borne on conidiophores frequently grouped in coremial masses. Chlamydospores, 4 to 12 $\mu$ in diameter, were present on irregular hyphae in the 'grains' of the mycetoma. The organism resembles *Allescheria boydii* Shear 1921, isolated from a similar case in North America, and is probably a closely related species.

Brumpt (E.) & Langeron (M.). **Considérations sur la piedra de l'Amérique du Sud, à l'occasion d'un cas provenant du Venezuéla. Description d'une espèce nouvelle Piedraia venezuelensis n. sp.** [Considerations on the South American 'piedra' in connexion with a case from Venezuela. Description of a new species, *Piedraia venezuelensis* n. sp.]—*Ann. de Parasitol. Humaine et Comp.*, xii, 2, pp. 134–161, 1 pl., 32 figs., 1934.

In this paper the authors draw a clear distinction between two types of 'piedra', the one of which, due to species of *Trichosporum*, chiefly occurs in the Old World [*R.A.M.*, xii, p. 172] and is characterized by light-coloured nodules on the affected hairs, consisting of an apparently sterile stroma and propagating by means of arthrospores. The other type is caused by species of *Piedraia* [ibid., ix, p. 36] and is so far restricted to South America [but cf. x, p. 243]. It is characterized by nodules of a very dark, almost black, colour, composed of a true ascostroma containing scattered embedded asci; careful investigation of samples sent in from

various South American States failed to reveal the presence of perithecia, such as have been reported by some other workers [ibid., x, p. 27; xii, p. 444]. In a few instances, however, some of the asci were found to be enclosed in a sac-like structure, which, on closer examination, was shown to be nothing else than an incurved fragment of the hair cuticle disrupted by the fungus.

A detailed account is given of the mycological study of five specific cases, two of which, originating from Brazil, were found to be caused by *P. hortai* [ibid., ix, p. 36; x, p. 27, *et passim*]; the third, also from Brazil, came labelled as *P. sarmentoi* [ibid., ix, p. 720], but as it was morphologically indistinguishable from the former, the authors are inclined to consider this a synonym of *P. hortai*. In all three the eight ascospores in each ascus had a long filiform appendage at each end. In the fourth case, from Colombia, the fungus had the same morphological details, except that the bipolar filaments were considerably shorter; it is also referred to *P. hortai*. The fifth case was communicated from Venezuela, and stated to be the first record of this type of 'piedra' in that country. It differed from the others in the shape of the hair nodules, which were ovoid or fusiform instead of conical and more or less sharply truncate, and also in the fact that the asci contained four instead of eight ascospores, which were without polar filaments, their ends simply tapering to a more or less elongated and sharp point. The asci in this fungus were about the same size as in the former cases (from 30 to 40 $\mu$ in length); the spores were rather thicker, their body measuring from 25 to 30 (occasionally 35) by 10 to 14 $\mu$, with long points (10 to 12 $\mu$) at each end; their general shape was that of a short and thick crescent. This fungus is considered to be a distinct species, and the name *P. venezuelensis* sp. n. is suggested for it, but without a full technical diagnosis.

MILOCHEVITCH (S.). **Trichophyton faviforme album als Erreger eines Kopfhautfavus.** [*Trichophyton faviforme album* as the agent of a scalp favus.]—*Med. Pregl.*, *1933*, 9, 1933. (Jugo-Slav, with French summary.) [Abs. in *Zentralbl. für Bakt.*, Ab. 1 (*Ref.*), cxiii, 17–18, p. 393, 1934.]

A sharply defined mantle of thick mycelial cells enveloped the hair shafts in a typical case of favus with localized scar formation examined at Belgrade. The scutula were composed of the spores and mycelial elements of a megasporous dermatophyte. Cultures yielded *Trichophyton faviforme album* [*T. album*: *R.A.M.*, xiii, p. 303] in characteristic colonies with a faviform centre, a white, pulverulent zone, and a colourless edge with radiating extensions. The case is considered to afford a further illustration of pleomorphism in the dermatophytes by an addition to the ranks of scutula-formers.

BEINTEMA (K.). **Über einen neuen Pilz der Endothrixgruppe: Trichophyton floriforme n. sp.** [On a new fungus of the endothrix group: *Trichophyton floriforme* n. sp.]—*Arch. für Dermatol.*, clxix, 4, pp. 575–581, 6 figs., 1934.

From the hair on the neck of a boy at Groningen, Holland, the writer isolated a *Trichophyton* of the endothrix group. On

Sabouraud's medium with maltose the hyphae measured 3 to 5 $\mu$ in diameter, and sometimes terminated in a septate, clavate swelling 8 $\mu$ in diameter; the spores were of very variable dimensions and formed in bunches. Terminal, lateral, and intercalary chlamydospores, 12 to 18 $\mu$ in diameter, with or without stalks, were also formed. Inoculation experiments on guinea-pigs resulted only in a very mild type of infection, followed by spontaneous healing. The fungus is related to *T. regulare* and *T. sulphureum* but is considered to be a new species and is named *T. floriforme*, the specific name referring to the flower-like aspect of the maltose cultures.

NEILL (J. C.). **The control of mould fungi in dairy factories and meat works.**—*New Zealand Journ. of Agric.*, xlviii, 2, pp. 70–75, 1934.

Experiments were carried out for the prevention of mould growth on the woodwork of factories where milk, meat, and the like are handled, since this is a common source of food stuff contamination [cf. *R.A.M.*, xiii, p. 443]. When wooden blocks planed smooth at the top and sides but left rough (as sawn) at the ends were inoculated with *Penicillium puberulum* [ibid., xii, p. 696], *P. expansum*, and *Cladosporium herbarum*, respectively, renewed sporulation was completely inhibited by dipping the blocks in, and wetting the mould colonies with, formalin solution (38·5 per cent.) 1 part in 20 parts water, kept in closed containers; borax solution (5 per cent.) inhibited sporulation of *P. puberulum* and *P. expansum* only. Renewed growth of *C. herbarum* was prevented by formalin 1 in 50 and copper sulphate 1 or 2 per cent., but various common chlorine disinfectants failed to prevent subsequent renewal of growth. Neither *C. herbarum* nor *P. expansum* was completely controlled by formalin when exposed in open dishes after treatment, though renewed sporulation occurred only on the rough surfaces of the blocks. The action of ammonia was similar to that of formalin on *C. herbarum*, but it had no apparent effect on *P. expansum*.

Thorough washing with water at 132° to 150° F. effectively controlled *C. herbarum*, especially when the blocks were rubbed with a cotton swab while under the water, but when the blocks were dipped for 5 seconds a temperature of 185° was necessary to give control on the rough surfaces, though on the smooth ones there was no renewal of growth after dipping at 165°. When a steam jet was directed for 3 seconds on the colonies of *C. herbarum* and *P. expansum*, growth was arrested on the smooth surfaces at 165°, but continued on the rough ones even after exposure to 195°.

STUART (L. S.) & FREY (R. W.). **Some practical observations on the molding of pickled sheepskins.**—*Journ. Amer. Leather Chem. Assoc.*, xxix, 3, pp. 113–118, 3 pl., 1 graph, 1934.

The examination of brown-stained pickled sheepskins dispatched to the United States in casks from New Zealand disclosed the presence of an *Alternaria* and a *Penicillium*, the former producing a dark brown, insoluble, mycelial pigment and the latter a diffu-

sible, yellowish-brown one on Czapek's agar. Both organisms grew in the presence of 12 per cent. sodium chloride at $P_H$ 2·4 and above, while at 1·8 only the *Penicillium* showed slight growth with 0 and 4 per cent. sodium chloride. Inoculation experiments with both moulds on skins soaked in a liquor containing 12 per cent. sodium chloride and 1·5 per cent. sulphuric acid gave negative results, and this indicated that the acidity of the damaged skins in question had undergone reduction during transit. It was then experimentally ascertained that the wood of the casks had absorbed the acid from the skins packed against it, and that it furnished a suitable substratum for the growth of the two above-mentioned fungi and *Aspergillus niger*. It would thus appear that the mildewing could have been largely or entirely prevented by a slight increase in the acidity of the original pickling liquor, or by soaking the casks before packing with the liquor. In substantiation of Blank's observations [see above, p. 486], p-nitrophenol at low concentrations in an acid substratum proved to be a highly effective fungicide. Skins prepared in a pickle containing, in addition to sodium chloride and sulphuric acid, 0·025 per cent. p-nitrophenol developed no mould during a 90-day incubation period.

ALLISON (C. C.). **Powdery mildew of Flax in Minnesota.**—*Phytopath.*, xxiv, 3, pp. 305–307, 1934.

The leaves, stems, and sepals of the C.I. 669 and C.I. 743 flax varieties near Anoka, Minnesota, were observed in 1933 to be heavily infected by a powdery mildew, with reddish-brown perithecia, 84·7 to 142·7 $\mu$ in diameter (mean 112·5 $\pm$ 0·37 $\mu$), bearing numerous flexuous, darkened, simple appendages and usually containing eight to twelve stalked asci, 21·3 to 34·6 $\mu$ (27·9 $\pm$ 0·20 $\mu$), occupied by two (rarely one or three) ascospores measuring 15·9 to 27·3 by 9·4 to 14·6 $\mu$ (mean 21·4 $\pm$ 0·13 by 11·6 $\pm$ 0·07 $\mu$). These dimensions agree with those of *Erysiphe cichoracearum* [*R.A.M.*, x, p. 459], and the conidia, measuring 23·1 to 33·5 by 12 to 18 $\mu$ (29·4 $\pm$ 0·16 by 15·1 $\pm$ 0·09), appear to correspond with those of *Oidium lini*, described from Jugo-Slavia and Japan [ibid., vii, p. 784].

**Carnation diseases.**—*The Fruit-Grower*, lxxvii, 1990, p. 179, 1934.

Writing in the January number of the *British Flower Marketing Association Bulletin*, G. W. Wickens gives an account of his investigations, under the supervision of Prof. W. Brown at the Imperial College of Science, on the wilt and stem rot group of carnation diseases. One of the manifestations of this complex condition is die-back (*Fusarium culmorum*) [*R.A.M.*, ix, p. 69], which is stated to be of little commercial importance, though fairly prevalent in nurseries. The shoots slowly die back from 'snags' left in 'stopping' or in cutting a bloom, but the affected plants usually recover. Stem rot (*F. culmorum* and, probably to a lesser extent, *F. herbarum*) [ibid., ix, p. 37; xiii, p. 13], on the other hand, is a really serious disease, causing generalized rotting of the tissues of the collar and occasionally of the branch bases, especially in old plants. Wilt is attributed to a *Fusarium* of the *Elegans* section and *Verticillium cinerescens* [ibid., ix, p. 6], of which the

latter was the more virulent in inoculation tests. The shoots wilt, often only on one side at first but later on both, and the water-conducting vessels become clogged by a brown, gummy substance. No improvement in the condition resulted from maintaining the beds in a dry state, as commonly recommended. Of the nine chemicals used in soil sterilization experiments only formalin and uspulun dust gave any reduction of infection, and the latter seriously injured germination. The risk of reinfection is minimized by the removal of the top soil, but fresh contamination may occur through the subsoil or manure.

OGILVIE (L.) & MULLIGAN (B. O.). **The Fusarium wilt of China Asters in England.**—*Gard. Chron.*, xlv, 2466, pp. 215–216, 3 figs., 1934.

The strains of *Fusarium* responsible for the wilt of China asters [*Callistephus chinensis*] observed by the writers in Worcestershire in 1928 [*R.A.M.*, ix, p. 700] and subsequently studied in, or reported from, other parts of England and Wales, were found to fall into the two groups assigned by Wollenweber to *F. conglutinans* var. *callistephi* and *F. conglutinans* var. *majus* [*R.A.M.*, xii, p. 448]. When the plants have formed their first flower buds, black areas may be detected on the stems, extending upwards from the base and often reaching well into the flower stalks. The leaves show a yellowish discoloration and wilt from the base upwards, either on one or both sides of the plant. The damping-off phase of the disease, common in other countries, was not encountered in the Bristol Province but was reported from Cheshire in 1933. The 'black leg' of asters in England, due to *Phytophthora cryptogea* [ibid., ix, p. 700], is quite distinct from the wilt described above.

In trials on severely infected soil near Evesham a high degree of resistance to *Fusarium* wilt was shown by a number of American varieties that have undergone similar tests in Wisconsin [ibid., xi, p. 302 *et passim*], those most likely to acquire popularity in England being Queen of the Market, American Branching, Improved Crego, and Giant Comet (all white), Upright Branching Crimson, Queen of the Market Dark Blue, and Improved Crego Purple and Deep Rose. No English varieties gave any sign of resistance under the experimental conditions.

CAMPBELL (A. H.). **Virus diseases of Dahlias.**—*The Dahlia Year Book, 1934*, pp. 14–23, 3 pl., 1934.

Dahlia mosaic [*R.A.M.*, xiii, p. 99] is characterized by a leaf mottle which generally consists of irregular, light yellowish-green patches of varying intensity; occasionally the leaf may be almost entirely yellowed, or only the edges may be affected. The leaves also show slight dwarfing, wrinkling, and malformation. Usually, the mottling is most evident while the plant is actively growing, and is much less marked in the older, stunted plants. Affected leaves are thick, hard, brittle, and may be basin-shaped. The larger exhibition types of dahlias are often dwarfed to one-quarter of their usual height, the leaves being of miniature dimensions but otherwise free from any malformation.

Streak is at present the most injurious disease affecting dahlias

in Great Britain. The affected plants are of the larger exhibition types, of which the light-coloured varieties are among the most susceptible, the dark ones being in some cases apparently immune. The distinguishing feature of the disease is the presence of long, black streaks on the stems and petioles; black, necrotic areas may be present on the flower stems and flowers. The lower leaves may die but remain attached to the plant. In the young petiole the attack originates in the phloem and chiefly affects the collenchyma, of the dead cells of which the black streak is composed. A tuber rot, sometimes affecting only a single tuber, is often associated with streak and consists of a brown, necrotic band lining a cavity in the centre of the tuber. The rotted portion is generally surrounded by apparently normal white tissue, and no secondary fungi or bacteria are present. Occasionally the tubers show small brown patches without any definite rot, but these are often probably the early stages of the rot.

Spotted wilt of dahlias is systemic and affected plants sometimes rapidly succumb; the characteristic symptom consists in concentric light and dark green (sometimes yellow) circles on the leaves [ibid., x, p. 694; xiii, p. 333]. The leaves and shoots may temporarily turn bronze before the concentric rings appear. At present the disease is not very common in England, and most cases observed by the author were on dahlias growing in close proximity to affected plants of other species.

The paper concludes with notes on the importance of virus diseases to dahlia growers and brief, practical directions for control.

BERGER (R.). **Wurzelkropf an Dahlien.** [Crown gall of Dahlias.] —*Blumen- und Pflanzenbau vérein. mit Gartenwelt*, xxxviii, 13, p. 167, 1934.

Attention is drawn to the occurrence, in the Frankfurt district of Germany, of the proliferation of dahlia shoots in the spring from a cauliflower-like basal swelling due to *Bacterium tumefaciens* [*R.A.M.*, xiii, p. 167]. The disease is most prevalent in damp, heavy soils, which should be well aerated, limed, and if necessary disinfected with uspulun or formaldehyde. Infected tubers may be dipped in an uspulun-loam emulsion. The Jersey Beauty, Andreas Hofer, Leuchtenburg, and other varieties of a rather weak habit of growth appear to be mainly affected.

PASSALACQUA (T.). **Expériences de vaccination sur le 'Pelargonium zonale'.** [Vaccination experiments on *Pelargonium zonale*.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 3, pp. 83–87, 1934.

Inoculations (made directly or by means of the absorption of culture filtrate) of *Pelargonium zonale* plants with the organism belonging to the *Bacterium barkeri* group isolated by the author from streaked leaves of this host [*R.A.M.*, xiii, p. 444], while not exactly reproducing the symptoms, gave partial or complete chlorosis of the leaf margins (according to the concentration of filtrate used), frequently followed by necrosis.

Vaccination with killed cultures either by needle prick of leafy

branches or by direct absorption of vaccine solutions by small branches in full vegetative development gave results which (although irregular) indicated that the host acquired some degree of definite immunity.

LAURITZEN (J. I.) & WRIGHT (R. C.). **Factors affecting Gladiolus in storage.**—*Journ. Agric. Res.*, xlviii, 3, pp. 265–282, 1 graph, 1934.

The results of storage experiments from 1927 to 1931 [details of which are given] at the Arlington Experiment Farm, Rosslyn, Virginia, showed that while very little infection with *Penicillium gladioli* [*R.A.M.*, x, p. 645] developed in the healthy, unwounded corms of all the *Gladiolus* varieties used at any of the conditions of temperature and humidity which were tested, infection was fairly heavy in the naturally or artificially wounded and inoculated corms kept at high relative humidities at 0° and 4·5° C., but not at 10°. The lowest relative humidities (about 63 and 75 per cent. at 0° and 4·5°, respectively) practically eliminated infection, regardless of wounding and inoculation.

Further experiments indicated that the higher temperatures and lower humidities favoured the formation of a suberin and periderm layer in wounded areas of the gladiolus corms, and that this layer is an effective barrier against infection by *P. gladioli* and other species of this genus. It was found that curing wounded corms for ten days at a temperature of 29° C. and a relative humidity of 97 per cent., inhibited a serious development of the rot (even in corms that were inoculated with *P. gladioli* spores over the wounded surface at the end of the curing period and before being stored) under any of the conditions tested. It is believed that this treatment before storage may be employed to prevent infection in the stored corms.

WEIMER (J. L.). **Studies on Alfalfa mosaic.**—*Phytopath.*, xxiv, 3, pp. 239–247, 3 figs., 1934.

An extended account is given of the writer's investigations on the transmissible mosaic of lucerne already reported from California [*R.A.M.*, x, p. 388], and believed to be of fairly wide distribution in other States. The first symptom of infection is the development on the leaves of circular, greenish-yellow, sometimes concentric spots, which often coalesce and cover a large area. The affected tissues fade gradually from greenish-yellow to almost white. The diseased leaves may be reduced to one-third of their normal size, crinkled, and in severe cases, more or less deformed, thickened, and brittle, the stems being also occasionally dwarfed. Details are given of inoculation experiments in which the pea aphid (*Illinoia* [*Macrosiphum*] *pisi*) transmitted this form of mosaic to 27 out of 74 plants (36·5 per cent.). One of the mosaic plants sent by F. R. Jones from Wisconsin for comparison with the Californian material showed slight differences, notably in the more marked crinkling of the foliage and the absence of rings round the spots. The plant in question had grown near many other kinds affected by mosaic, from one of which infection was probably transmitted [cf. ibid., xii, p. 741].

HENDERSON (R. G.). **Occurrence of Tobacco ring-spot-like viruses in Sweet Clover.**—*Phytopath.*, xxiv, 3, pp. 248–256, 4 figs., 1934.

Besides the sweet clover (*Melilotus alba*) disease closely resembling tobacco ring spot [*R.A.M.*, xi, p. 133], a distinct ring spot was observed on sweet clover leaves in Virginia in May, 1932. The leaves showed irregular chlorotic, frequently circular blotches following the midrib and extending along the lateral veins towards the margin. The younger leaves were severely stunted and distorted. Inoculations on Turkish tobacco plants with an aqueous extract from the diseased foliage produced variable necrotic or chlorotic symptoms in the form of lines or rings, cutting off the intercostal tissue into islands of irregular shape; in severe cases the tissue along the veins was abnormally dark. Some of the upper leaves developed broad chlorotic or bleached lines, generally following the veins and near the margin, while yellow blotches were present in the centre. Not all the leaves on a given plant contracted these symptoms, but there appeared to be no masking or permanent immunity as described by Wingard and Price for true tobacco ring spot [ibid., viii, p. 139; xii, p. 120].

*Petunia* foliage inoculated with the *M. alba* virus showed chlorotic areas along the margin and spots or blotches elsewhere, sometimes turning almost the whole leaf yellow to light green, while in other cases small specks appeared along the midrib and veins or over the entire leaf, to which a grey cast was thus imparted. None of the *Petunia* leaves seemed to be exempt from infection, which assumed a severe form on some of the branch tips, causing foliar distortion and partial tissue necrosis.

Negative results were given by experiments in the retransmission of infection to sweet clover, possibly on account of environmental factors, and the writer also failed to infect *M. alba* with true tobacco ring spot which Wingard has shown will infect *M. officinalis* [ibid., viii, p. 139; xi, p. 132].

FR. **Über das Auswintern des Klees.** [On the winter injury of Clover.]—*Deutsche Landw. Presse*, lxi, 9, p. 110, 1934.

A brief, popular note is given on the stem rot of clover caused by *Sclerotinia trifoliorum* [*R.A.M.*, xiii, p. 240] in Germany. The red [*Trifolium pratense*] varieties of southern European origin are stated to be the most severely affected, and their replacement by German material from disease-free fields is urgently recommended.

DOYER (L[UCIE] C.). **De gezondheidstoestand van Klaverzaad, in verband met de keuring van det zaad en de invloed van ontsmetting op dezen toestand.** [The state of health of Clover seed in connexion with the selection of this seed and the effect of disinfection on that state.]—*Tijdschr. over Plantenziekten*, xl, 2, pp. 54–61, 2 pl., 1 fig., 1934.

After summarizing the differences between the sclerotia of *Sclerotinia trifoliorum*, *Typhula trifolii*, and *Mitrula sclerotiorum* [*R.A.M.*, vii, p. 450; x, p. 670], the writer states that at the Wageningen Seed Testing Station clover seed has only once been

found contaminated by the sclerotia of each of the two first-named [cf. ibid., xii, p. 294], while *M. sclerotiorum* has been recorded in clover seed only in Denmark. It is, however, commonly contaminated by *Botrytis cinerea*, *B. trifolii* [ibid., viii, p. 41], *Fusarium* and *Macrosporium* spp., while references occur in phytopathological literature to clover seed infection by *Sphaerulina trifolii* [ibid., ii, p. 414] and *M. sarcinaeforme* [ibid., xi, p. 377]. There is, further, a somewhat remote possibility of seed transmission in the case of *Gloeosporium caulivorum* [*Kabatiella caulivora*: ibid., xiii, p. 382]. Good results in the disinfection of red [*Trifolium pratense*] and white [*T. repens*] clover seed have been obtained by one hour's immersion in a 0·25 per cent. solution of germisan or ceresan or by dusting with ceresan, the germination percentages of the treated seed being 60, 64, and 51, respectively, compared with 46 for the untreated. In 1924, however, the germinative capacity of the seed was considerably impaired by immersion in germisan or uspulun even at a strength of 0·25 per cent. while a concentration of 0·5 per cent. was found to be definitely injurious. Possibly there may be some connexion between damaged seed coats and a reduction of germination due to over-intensive fungicidal action; in any case it is advisable to submit a sample of each lot of seed to a preliminary test before treating the entire batch.

Cook (W. R. I.). **Some observations on the genus Cladochytrium with special reference to C. caespitis Griffon and Maublanc.**—*Ann. of Botany*, xlviii, 189, pp. 177–185, 1 pl., 9 figs., 1934.

In 1932 the author received from Yorkshire *Agrostis* seedlings killed by a fungus at first thought to be *Cladochytrium graminis* Büsgen, but comparison at Kew herbarium with material of this species and of the fungus on an unnamed grass from Surrey referred by Massee to it showed that both the Yorkshire and the Surrey material differed from the rest and agreed with the description of *C. caespitis* given by Griffon and Maublanc in the size of the resting sporangia (30·7 by 14·8 $\mu$ and 34·2 by 25·8 $\mu$, respectively, as against an average of 33·9 by 30·1 $\mu$ for the material of Büsgen's species), their elongated or spherical shape, their presence mainly in the roots instead of in the leaves, and the very pale yellow or almost colourless cell wall. The author's organism is accordingly referred to *C. caespitis* (apparently not before recorded in England), and it is suggested that the material from Surrey preserved at Kew as *C. graminis* is also *C. caespitis*.

Infection (presumably by zoospores) results in the formation in the host cell of a small spherical body which then elongates to form a short hypha; this branches out into an irregular unseptate mycelium with densely granular contents and apparently multinuclear. The hyphae swell at various points into vesicles which become differentiated into resting sporangia. Apparently these are at first uninucleate, though when fully mature several nuclei may be present. After a resting sporangium has formed, the hyphae associated with it rapidly disappear. The wall of the mature, ellipsoidal, occasionally spherical, sporangia is thick, smooth on the outside, very light yellow, and 3 to 5 $\mu$ wide. Germination was not observed and the thin-walled type of

sporangium liberating uniciliate zoospores, of which Griffon and Maublanc found a single example, was not seen.

Discussing the classification of the genera *Cladosporangium*, *Physoderma*, and *Urophlyctis* the author urges that it would be better to revert to Fischer's treatment and regard them as subgenera of *Cladochytrium*; *Cladosporangium* and *Physoderma* might well be combined, as a series of types passing from one to the other can be traced.

DAHL (A. S.). **Snowmold of turf grasses caused by Fusarium nivale.**—*Phytopath.*, xxiv, 3, pp. 197–214, 5 figs., 1 graph, 1934.

Snow mould (*Calonectria graminicola*) is stated to be responsible for heavy damage to turf grasses on golf courses and the like in the United States and Canada [cf. *R.A.M.*, xii, p. 754], affecting in the United States *Poa pratensis*, *P. annua*, *Agrostis alba*, *A. palustris*, *A. canina*, *A. tenuis* [*A. vulgaris*], and *Festuca rubra*, besides rye, wheat, and barley.

The fungus grows well on oatmeal and potato agar and on sterile grass clippings, but forms spores freely only when the cultures are exposed to diffused light, under the influence of which the colour of the mycelium changes from white to pink. Growth occurred at a range of 2° to 32° C., with an optimum at about 20°. Inoculations on the above-mentioned hosts and oats in moist chambers were most successful at 0° to 5°. Temperature records taken beneath the snow also indicated that the fungus caused infection at about freezing point. Attacks of the disease are promoted by a damp autumn, the falling of snow on unfrozen ground, deep snow, and a prolonged cold, wet spring. The application of organic manure in the late autumn was also found to increase the severity of the disease, the control of which was accomplished, in experiments at Grand Rapids and Minneapolis, by the treatment of the turf in the autumn with mercuric chloride or calomel [mercurous chloride] at the rate of 3 oz. per 1,000 sq. ft., as previously used by Monteith against *Rhizoctonia* [*Corticium*] *solani* [ibid., vi, p. 489].

Differences were observed between the reactions of the various commercial strains of *Agrostis* to snow mould infection, the Colonial and Metropolitan types being much hardier than those of Columbia, while Washington is susceptible but suffers no permanent damage.

**Fungus and other diseases of fruit trees.**—*Min. of Agric. and Fish. Collected Leaflets* 1, 90 pp., 38 figs., 1934.

These leaflets (collected in portfolio form) issued by the Ministry of Agriculture and Fisheries contain brief, practical notes on the symptoms, causes, and control of a number of common fungal and other diseases of fruit trees in England; they are illustrated with useful plates designed to facilitate diagnosis.

GLOYER (W. O.). **Crown gall and hairy root of Apples in nursery and orchard.**—*New York* (*Geneva*) *Agric. Exper. Stat. Bull.* 638, 30 pp., 15 figs., 1934.

This is a progress report of an investigation which was started in 1925 for the purpose of testing the effect of crown gall (*Phytomonas*

[*Bacterium*] *tumefaciens*) and hairy root (*P.* [*Bact.*] *rhizogenes*) [*R.A.M.*, xiii, p. 450] on the health, growth, time of fruiting, and yield of infected apple trees under New York orchard conditions. Observations in 1933 showed that the result of root infection of the nursery stock at the time of planting was not uniform for all the varieties tested. Wealthy trees infected with hairy root gave the smallest trees of any group, while the infected McIntosh trees were as good as the controls. Badly galled Baldwin, McIntosh, and Wealthy trees were on the average smaller than the controls. It was found, however, that the height and diameter of the tree were not always an accurate measure of the injurious effect of either disease, other variables such as branch and root pruning, shape and distribution of the root system, and the like, sometimes exerting a greater influence on top growth than the presence or absence of root infection. As a general rule, trees that had a well-developed and healthy root system at the time of planting tended to give the best top growth, while the presence of either crown gall or hairy root tended to produce an abnormal root system, the presence of crown gall invariably tending to cause a girdling effect and inhibiting the formation of roots on the infected side of the tree.

Inspections of apple nurseries in New York showed that the incidence of crown gall has been considerably reduced, as compared to that some ten years ago, owing to the fact that nursery stock is now chiefly propagated by budding instead of by grafting. Budded apple trees, however, may be badly infected when grown in sites heavily infected with crown gall from previous nursery crops, no varietal differences in susceptibility being observable in such cases. Inoculations with *Bact. tumefaciens* on orchard trees showed that the organism may remain latent and not show any visible sign of gall formation until the third growing season.

From a practical point of view, the investigation indicates the disadvantage of planting infected nursery stock, and it is considered that a relaxation or modification of the inspection regulations now in force in New York is not warranted.

MOORE (M. H.). **Spraying and dusting experiments on the control of Apple scab (Venturia inaequalis) and Apple mildew (Podosphaera leucotricha) at East Malling in 1931–1932.**— *Journ. Pomol. and Hort. Science*, xii, 1, pp. 57–79, 4 pl., 1934.

This is a detailed account of the results obtained from continued experiments in 1931 and 1932 at the East Malling Research Station on the control of apple scab (*Venturia inaequalis*) and mildew (*Podosphaera leucotricha*) on Cox's Orange Pippin trees [*R.A.M.*, xii, pp. 297, 767], including a discussion of different methods of expressing and interpreting the tabulated data. Generally speaking, the results largely confirmed those of previous work, although in 1932 the weather conditions were such as to render two pre-blossom sprays necessary for effective control of apple scab for the first time during the whole period of the investigation. 'Half-strength' (4-18-100) Bordeaux mixture caused no damage in 1932, but gave indifferent control of scab. Colloidal sulphur was found

to be less effective than lime-sulphur, but its effect appeared to depend on the season, since it gave good control in 1931 though not in 1932. The same appeared to be also true of sulphur dust, which proved to be useful at the post-blossom stage as an adjunct to spraying, but was unreliable when used alone both in pre- and post-blossom applications. During the generally wet summer of 1931 additional sulphur dustings afforded good protection against infection, and the indications were that where dusting is practised alone, the number of applications should be increased and they should be made in advance of infection. The best results of all were obtained with lime-sulphur, which gave good control of apple scab and mildew, as well as of red spider [*Paratetranychus pilosus*]; the addition of gelatine, however, somewhat reduced its control of scab. Post-blossom applications of sulphur and lime-sulphur caused fruit drop in 1932 but not in 1931.

There was still further confirmation of the influence of the root-stock on the susceptibility of the leaves and fruit to infection with scab, and some evidence was obtained that the disease may be more easily controlled on trees worked on certain stocks than on others. The severe russeting which was caused in 1932 is considered to be the result of the interaction, on the trees, of soft soap with lead arsenate (or its derivatives) in pre-blossom applications. Some data are also presented on the cumulative effect of previous treatments.

ESMARCH (F.). **Der Nectria-Krebs der Obstbäume.** [The *Nectria* canker of fruit trees.]—*Die Kranke Pflanze*, xi, 2, pp. 15–17, 1 col. pl., 1934.

This is a popular note on the canker of fruit (chiefly apple) trees in Germany caused principally by *Nectria galligena*, occasionally by *N. ditissima* [*R.A.M.*, vii, p. 676]. The symptoms, mode of infection, life-history of the causal organisms, varietal susceptibility, and control of the disease are discussed.

BRIEN (R. M.). **The fungi causing rots of stored Apples in New Zealand.**—*New Zealand Journ. of Agric.*, xlviii, 3, pp. 143–149, 9 figs., 1934.

The author states that isolations in 1931 and 1932 from all the various types of rots which were found on specimens of apples held in cool storage in seven centres in New Zealand, yielded the following fungi: *Penicillium expansum* [*R.A.M.*, xiii, p. 108] (causing an average of 5·6 per cent. infection), *Botrytis cinerea* (16·83 per cent. infection), *Gloeosporium perennans* [ibid., xii, p. 702] (13·9 per cent.), *Gloeosporium* sp. (only isolated from Delicious apples from Auckland, where it caused about 10 per cent. wastage), *Glomerella cingulata* (6·6 per cent.), *Neofabraea malicorticis* [ibid., xii, p. 299] (5 per cent.), *Polyopeus purpureus* var. *verus* [ibid., iii, p. 402] (15·1 per cent.), *Fusarium lateritium* var. *fructigenum* [ibid., xiii, p. 106] (2 per cent.), *Alternaria tenuis* (two specimens only), *Pleospora* sp., *Isaria felina* var. *pirina* [ibid., i, p. 63], *Pullularia pullulans*, *Rhizopus nigricans*, and *Hormodendrum* sp. The five last-named species were found so rarely as to indicate that they are of little economic importance.

The pathogenicity of these fungi was tested in artificial inoculation experiments at the Plant Research Station, Palmerston North, on the varieties Jonathan, Cox's Orange Pippin, Delicious, and Sturmer, and a brief description is given of the type of rot produced by each of them in cool storage.

It is pointed out that during this investigation no sign was found of infection of the stored apples with *Sphaeropsis malorum* [? *Physalospora obtusa*: ibid., iii, p. 274; xiii, p. 313] or *Diaporthe perniciosa*, the occurrence of which in consignments of New Zealand apples at the time of their arrival in England was reported by Mrs. Kidd in 1928 [ibid., ix, p. 41], with a further record for *S. malorum* in 1932 in an unpublished report by Miss Hellinger. *S. malorum* is stated to be exceedingly rare in cool store in New Zealand, and *D. perniciosa* has not yet been collected in the Dominion.

SETH (L. N.). **Studies in the genera Cytosporina, Phomopsis, and Diaporthe. V. Analysis of certain chemical factors influencing fungal growth in the Apple.**—*Ann. of Botany*, xlviii, 189, pp. 69–107, 26 graphs, 1934.

The author's investigation [which is fully described, and the results of which are tabulated and expressed graphically] into the effect of change in the concentration of malic acid and sugar, in a standard nutrient medium containing both, upon the rate of radial spread of various fungal strains attacking apples [cf. *R.A.M.*, xii, p. 573] showed that the relation between spread and different combinations of acid and sugar was affected by the strain, the kind and concentration of sugar, and, when mixed sugars were used, by the relative proportions of glucose, sucrose, and fructose.

With *Cytosporina ludibunda* strain CE spread was inversely proportional to malic acid concentration. With *C. ludibunda* strain $CC_2$ [ibid., xii, p. 378] spread increased with increasing acid or glucose up to an optimum concentration of either and then decreased. In both *C. ludibunda* strain CE and *Phomopsis coneglanensis*, while spread decreased with increasing acid, the curves became increasingly complex as the glucose concentration increased, with a second maximum at the highest glucose concentrations. All the curves in this last system tended to intersect at a point representing a concentration of acid where spread was independent of glucose concentration.

The systems of curves underwent modification when sucrose or fructose or different combinations of glucose, fructose, and sucrose replaced glucose in combination with malic acid. In general, fructose favoured fungal growth at low concentrations of malic acid, but the reverse obtained at higher concentrations.

The curves representing the radial spread of certain strains in relation to the varied chemical composition of media containing nitrogen, malic acid, and sugar in the proportions found by chemical analysis in apples at different times during storage very closely resembled the curves representing the progress of the invasion of fruit tissues by the same strains.

In the media used in the investigation the strains fell into the following groups in order of decreasing rate of spread: (1) *P. citri*,

strain Jaffa 18 and *P. coneglanensis*; (2) *C. ludibunda* strain CE, *Diaporthe perniciosa* strain DHF, *P. citri* strain Brazil 20; (3) *C. ludibunda* strain $CA_4$ and *D. arctii* [ibid., x, p. 386]; (4) *P. vexans* and *C. ludibunda* strain $CC_2$. The same order held for power of attacking apples. When the strains in any one group were considered individually, the order varied with increasing acidity of the media. A similar variation also occurred with age of apple (acidity falling with advancing age) and with apple varieties differing in acidity.

ALLEN (T. C.), PINCKARD (J. A.), & RIKER (A. J.). **Frequent association of Phytomonas melophthora with various stages in the life cycle of the Apple maggot, Rhagoletis pomonella.**—*Phytopath.*, xxiv, 3, pp. 228–238, 1 fig., 1934.

*Phytomonas* [*Pseudomonas*] *melophthora*, the agent of an apple rot in Wisconsin, has frequently been found associated with both male and female adult flies of the apple maggot (*Rhagoletis pomonella*), as well as with the eggs, larvae, and puparia [*R.A.M.*, xi, p. 657]. It has further been detected in the ovipositor punctures, larval burrows, and exit holes of the insects in the apple. The organism was recovered from adult flies and larvae following superficial disinfection.

TANAKA (I.). **Studies on the canker disease of Pear tree caused by Diaporthe ambigua Nitschke.**—*Hokkaido Agric. Exper. Stat. Rept.* 31, pp. 85–122, *5–7*, 5 pl., 1934. [Japanese, with English summary.]

Pears (*Pyrus communis*) are stated to suffer severe damage in Hokkaido from canker (*Diaporthe ambigua*) [*R.A.M.*, xi, p. 95], an amended diagnosis of which is given in Latin.

The first symptom of the disease is the formation in the spring of swollen, water-soaked spots on the bark, often accompanied by wilting of the leaves. In June numerous pycnidia of the *Phomopsis* stage of the fungus develop on the infected bark, to be followed in October or in the next spring by the perithecia of *D. ambigua*. A brown line is formed between the healthy and diseased portions of the wood, the host cells along which are filled with a brownish gum. A black line, consisting of the plectenchyma of the fungus, runs irregularly through the affected wood.

The optimum temperature for the germination of the fusiform pycnospores was found to be 25° C. and for that of the ascospores 20°; the thermal death point of the former is 47·5° (five minutes' exposure). The pycnospores succumbed to 20 hours' freezing, which did not, however, prevent ascospore germination. Mycelial growth was most profuse at 22° to 23° ($P_H$ 5·4), the development of the fungus being completely inhibited in the presence of 0·1 per cent. tannic acid. Compared with the white, cottony mycelia of *P. fukushii* [ibid., vii, p. 521] on Japanese pear [*Pyrus serotina*] and *Phomopsis* sp. on Chinese pear [(?) *Pyrus serotina* var.], the imperfect stage of *D. ambigua* makes a slow, compact growth of velvety aspect, thriving in media containing fructose, maltose, or soluble starch as sources of carbon; the last-named was not utilized by the *Phomopsis* from Chinese pear.

TANAKA (I.). **American Gooseberry mildew in Japan.**—*Hokkaido Agric. Exper. Stat. Rept.* 31, pp. 123–139, 2 pl., 1934. [Japanese, with English summary.]

In 1927 American gooseberry mildew (*Sphaerotheca mors-uvae*) was observed on *Ribes grossularia* imported from Europe at Kotoni, near Sapporo, Hokkaido, where it had already been noticed by growers in the preceding season. During the next two years the disease spread throughout the province, causing extensive damage; a measure of control, however, has been achieved by five or six applications of lime-sulphur between the opening of the buds and mid-June. *R. hirtellum* has shown a high degree of resistance to *S. mors-uvae* under local conditions, while currants (*R. nigrum* and *R. rubrum*) are immune.

ZELLER (S. M.) & LUND (W. T.). **Yellow rust of Rubus.**—*Phytopath.*, xxiv, 3, pp. 257–265, 1 graph, 1934.

Continuing the studies initiated by the senior writer on the yellow rust of raspberries in Oregon [*R.A.M.*, ix, p. 535], a comparative investigation was made of American, British, and Italian material of *Phragmidium rubi-idaei* [ibid., iii, p. 428], to which the disease is now attributed instead of, as heretofore, to *P. imitans*.

On the susceptible Cuthbert variety in the field the teleutospores first appear early in July, and by October they are so numerous as to form a sooty black layer on the lower leaf surfaces. Attempts to induce germination on living leaves in the greenhouse failed until the following January. Pycnidia were first observed on the new leaves in the field late in March and inoculation experiments showed that they develop 10 to 13 days after greenhouse infection with the teleutospores.

The histological and cytological features of *P. rubi-idaei* were found to agree with Blackman's description of *P. violaceum* (*Ann. of Bot.*, xviii, p. 323, 1904) and Christman's of *P. speciosum* (*Bot. Gaz.*, xxxix, p. 267, 1905), except that in these two species the pycnidia are on the opposite side of the leaf to the aecidia, whereas in the raspberry rust the aecidia immediately surround the pycnidia in a completely encircling sorus. In the early stages of aecidial development the primordial mycelium and buffer and stalk cells are uninucleate, the first binucleate cells apparently occurring in the erect aecidial hyphae.

The sporidia can apparently infect both leaf surfaces irrespective of the stomata, aecidia being generally most common on the upper side in the field. Mature uredosori develop 8 to 13 days after inoculation with aecidiospores and uredospores in the greenhouse, always appearing directly below the stomata on the lower leaf surface only.

In inoculation tests the following proved to be immune: *Rubus laciniatus* (Evergreen blackberry), *R. macropetalus* (North-west trailing blackberry), *R. parviflorus* [*R. nutkanus*] (thimble-berry), *R. spectabilis* (salmon berry), and the Munger and Plum Farmer varieties of *R. occidentalis*. Of the red raspberry varieties (*R. idaeus* and *R. strigosus*) used in the trials, Chief and Latham proved resistant, Lloyd George tolerant, Antwerp, Owasco, and

Seneca moderately resistant, and Ranere, Cayuga, Herbert, Golden Queen, Cuthbert, and Marlboro increasingly susceptible in the order named.

MEHRLICH (F. P.). **Control of Phytophthora heart rot of Pineapple plants.**—*Phytopath.*, xxiv, 3, pp. 173–196, 3 figs., 1 graph, 1934.

A comprehensive, fully tabulated account is given of the writer's experiments with 22 liquid and 12 dry fungicides in the control of *Phytophthora cinnamomi* and *P. parasitica* (taken as including *P. melongenae* Sawada), two of the agents of heart rot of pineapple in Hawaii, *P. palmivora* being the third [*R.A.M.*, xii, p. 303]. The best results were given by dipping the planting material in 1–0·7–3 Bordeaux mixture, the estimated cost of which is $7·00 per acre of 10,000 plants. A single application in eight separate experiments under conditions highly favourable to the disease gave an average control of 80·29 per cent. (range 63·40 to 90·95 per cent.). The average incidence of infection in the adjacent untreated plots was 44·8 per cent. (19·14 to 83·07 per cent.). Full directions are given for the preparation and application of the mixture.

LEWCOCK (H. K.). **Yeasty rot of Pineapples and its control.**—*Queensland Agric. Journ.*, xli, 2, pp. 128–131, 1 fig., 1934.

Pineapples in transit from Queensland to the southern parts of Australia are liable to serious wastage (amounting to 40 per cent. in individual consignments) from attack by species of *Saccharomyces*. The first characteristic symptom of 'yeasty rot' consists in the exudation of bubbles of gas and liquid through cracks in the skin. As fermentation progresses the fruit rapidly loses weight, until it is reduced to a mere shell enclosing a mass of fibrovascular strands. The skin becomes thick, tough, and leathery. No external discoloration occurs until the final stage, when secondary rots frequently induce a brown decay. The flesh of affected pineapples is canary-yellow, stringy, and pitted with large cavities from the skin almost to the core.

Infection, which takes place only when the fruit is ripe and the skin cracked, is favoured by high, and inhibited by low temperatures. Occasional field infections cause no material loss. The incidence of rainfall during growth is the chief factor indirectly limiting the infection that subsequently develops when high temperatures prevail during transport; protracted drought during the growing season causes the fruit to become skin-bound, and if heavy rains fall during ripening time the tissues swell and the skin develops cracks through which the rot organisms effect their entry. In seasons of normal rainfall the disease is comparatively unimportant.

The paper concludes with brief notes on control by improved packing and sanitary methods.

SMALL (C. G.). **Quantitative determination of sulphur on leaves by titration.**—*Phytopath.*, xxiv, 3, pp. 296–299, 1 fig., 1934.

During five years' experimental work on apple spraying and dusting with sulphur fungicides a simpler technique [full details of

which are given] for the quantitative determination of the amount of sulphur adhering to the leaves than those formerly employed [*R.A.M.*, v, p. 311] has been devised. It is based on the volumetric determination of the amount of sodium hydroxide consumed in the oxidization of sulphur to sodium sulphate. The new procedure, while not sufficiently accurate for delicate chemical analyses, appears to be entirely satisfactory for the object in view.

YOUNG (P. A.). **Fungi and bacteria as indicators of the effects of petroleum oils on Apple leaves.**—*Phytopath.*, xxiv, 3, pp. 266–275, 1 fig., 1 graph, 1934.

The following test may be applied to the determination of the toxic effects of oils on apple foliage [*R.A.M.*, xii, p. 29]: agar slant subcultures of *Rhizopus nigricans* are submerged before growth becomes visible in the autoclaved oil to be tested; in some of the tubes nujol or a similar unsulphonatable oil is used while others are kept without oil for comparison. The cultures are then incubated for five days at 20° to 25° C. and the height, sporulation, and extent of spread of the hyphae recorded. Only those oils permitting profuse growth of *Rhizopus* are likely to be sufficiently innocuous for practical use as sprays on apple leaves. Other fungi suitable (though slightly less so than *R. nigricans*) as indicators of the toxicity of oils include *Mucor glomerula* and *Helminthosporium sativum*.

MCDANIEL (A. S.). **Colloidal bentonite-sulfur. A new fungicide.**—*Indus. & Engin. Chem.*, xxvi, 3, pp. 340-345, 3 figs., 1 diag., 1 graph, 1934.

The properties of colloidal bentonite-sulphur (kolofog, koloform, kolodust, kolotex, etc.) [*R.A.M.*, xii, p. 708 *et passim*] are discussed with reference to the essential requisites of an 'ideal' sulphur fungicide. The method of manufacture is described and evidence, claimed to be conclusive, is adduced that the sulphur particles in the new preparation are radically smaller than those of any known commercially obtainable wettable sulphur. The presence of sulphur in an elemental rather than in a compound form insures a wide margin of safety for the plants treated with the above-mentioned preparations, while adhesiveness, wettability, and spreading capacity are guaranteed by the highly gelatinous character of the product.

GALLWITZ (K.), BENZ (T.), & UNGERER (H.). **Untersuchungen an Obstbaumspritzen.** [Investigations on fruit tree spraying apparatus.]—*Tech. Landw.*, xv, 2, pp. 47–49; 3, pp. 60–61, 2 figs., 4 diags., 1934.

Full technical details are given of the construction and application of eight orchard spraying apparatus examined by the writers at the instance of the engineering department of the Baden Farmers' Chamber. On the basis of the resulting judgments the six firms represented were furnished with criticisms embodying proposals for certain improvements.

THOMAS (P. H.). **Stationary spray plants. Success in Tasmania.** —*Fruit World of Australasia*, xxxv, 2, pp. 71–73, 3 figs., 1934.

After stating that there are now over 23 stationary spraying systems [*R.A.M.*, xi, p. 385], mostly of the overhead type [ibid., ix, p. 791], in the orchards of south Tasmania, the author briefly describes the method of installation and operation, and points out that the 'dead end' system [ibid., viii, p. 587], in which the pipes radiate from a main and terminate at the boundaries of the orchard, while cheap to instal, is difficult and wasteful to work as compared with the 'return' system, in which the ends of the pipes are connected with the pumping unit.

The paper terminates with short, practical notes on layout methods.

KOTTE (W.). **Die Aufgabe der Phytopathologie beim Aufbau der türkischen Landwirtschaft.** [The function of phytopathology in the organization of Turkish agriculture.]—*Angew. Bot.*, xvi, 2, pp. 187–201, 1 fig., 2 maps, 1934.

Some general observations are made on the climatic conditions of Turkey, followed by a discussion (based on a two years' stay in the country) of some of the more important phytopathological problems requiring investigation. Necessary preliminaries to the work of plant disease control are the expansion of the phytopathological research stations, the education of agricultural students and officials in phytopathological subjects, and the establishment of an effective plant protection organization.

MACHACEK (J. E.). **A simple method of obtaining Pythium cultures free from bacteria.**—*Phytopath.*, xxiv, 3, pp. 301–303, 1 fig., 1934.

The writer has devised a method, involving the same principle as that of W. Brown (*Ann. of Botany*, xxxviii, p. 401, 1924), for the purification of cultures of *Pythium* from bacterial contamination. The contaminated inoculum is covered with a sterile glass disk, 20 mm. in diameter, and placed on melted potato-dextrose agar, the disk being pressed down to ensure complete contact with the medium. The disk prevents the lateral spread of the bacteria on the surface of the medium while permitting the growth of subsurface hyphae, which begin to emerge from below the disk within a few days. Transfers from the purified mycelium may then be made.

BUTCHER (R. W.). **Zostera. Report on the present condition of Eel Grass on the coasts of England, based on a survey during August to October, 1933.**—*Journ. Conseil. Internat. Explorat. de la Mer*, ix, 1, pp. 49–65, 3 figs., 1 map, 1934.

A brief history of the obscure epidemic involving the wholesale disappearance of eelgrass (*Zostera marina*) in parts of the coastal regions of North America and Europe is given, based on a survey of the relevant literature, correspondence with persons interested in the phenomenon, and observations on the English coasts from

August to October, 1933. In Danish [*R.A.M.*, xiii, p. 317] and Swedish waters the disease appears to be restricted to certain localities, while no reports of its occurrence have been received from Germany, Norway, or the Mediterranean. As regards England, the writer believes that the gradual dying-out of the grass-wrack seaweeds has been in progress for the last ten years or more, though the rapid destruction of the broad-leaved type (*Z. marina*) would appear to date only from 1931–2. In many cases the amount and nature of the organic matter in the substratum may be a limiting factor in the growth of the eelgrass; *Z. marina* thrives in clean mud and is liable to degeneration in the presence of pollution from oil deposits, decaying refuse, and the like. As the mud becomes fouler the small-leaved forms *Z. nana* and *Z. marina* var. *angustifolia* tend to replace *Z. marina*.

ATANASOFF (D.). **Virus diseases of plants. A bibliography.**—iv + 219 pp., Houdojnik Printing Co., Sofia, 1934.

In a brief preface to this very useful book the author states that its purpose is to present, for the use of students of plant virus diseases, a comprehensive list (compiled to the end of 1932) of the relevant literature that has accumulated in the course of time (some of the references are two hundred years old), much of which is difficult of access or has fallen into oblivion. In its main lines, the list is classified according to the hosts of the virus diseases, with a special section at the beginning of each family of plants to include papers dealing with virus diseases affecting more than one host. The book terminates with an alphabetical index of all the authors cited, and another of the host plants dealt with.

RAYNER (M. C[HEVELEY]). **The mycorrhiza of conifers: a review.**—*Journ. of Ecology*, xxii, 1, pp. 308–312, 1934.

The assumptions of McArdle and Laing [*R.A.M.*, xi, p. 527; xii, p. 183] regarding the relationship between conifers and mycorrhiza are examined and their conclusions as to the lack of positive evidence of a physiological connexion rejected on the basis of the writer's experimental studies of the genus *Pinus* (in preparation for publication) [cf. also xiii, p. 255]. A preliminary summary of these investigations, conducted in Great Britain and the United States, is given.

MENON (K. P. V.). **Studies in the physiology of parasitism. XIV. Comparison of enzymic extracts obtained from various parasitic fungi.**—*Ann. of Botany*, xlviii, 189, pp. 187–210, 28 graphs, 1934.

A full account is given of experiments made to ascertain whether the pectinase enzyme obtainable from one fungus agrees in its properties with that obtainable from another prepared by the same method, either Brown's plate method being used, in which the fungi were germinated in liquid extracts, or a plug method in which pieces of plant tissue were inoculated and subsequently extracted. The enzymic extracts were purified once by precipitation with alcohol, quantitative comparison being made by Brown's mechanical test method. They were then tested as regards (*a*) effect

of $P_H$ concentration on enzyme activity and (*b*) specific retarding action of water, potato, apple, and turnip juices, magnesium sulphate, and potassium phosphate. The fungi used were *Botrytis cinerea*, *Monilia* [*Sclerotinia*] *fructigena*, *Gloeosporium fructigenum*, *Fusarium* [*lateritium* var.] *fructigenum* strain $C_2$, all parasitic on apple, and *Pythium de Baryanum* and *Phytophthora erythroseptica* parasitic on potato.

The results obtained [which are tabulated, expressed graphically, and fully discussed] while fully confirming the conclusions reached by Chona [*R.A.M.*, xii, p. 184] demonstrated that the same differences of behaviour noted by him as between the enzymes of *Botrytis* and *Pythium* may also be shown by enzymic preparations of the same fungus, according to the method of preparation, from which it may be assumed that the enzyme is the same in all cases, but that certain of its properties are profoundly modified by the adsorption of substances from the nutrient medium. Evidence was obtained that the type of medium used may determine whether any enzyme is formed at all; cultures of *Pythium* and *Phytophthora* grown in various decoctions produced no enzyme, but secreted it freely when grown on plant tissue. A somewhat similar result was obtained with *S. fructigena*. In conclusion, it is suggested that the presence of pectin in the substratum favours the secretion of pectinase enzyme by fungi.

PEYRONEL (B.). **Sur quelques formes de 'Botrytis' du type 'cinerea' produisant un pigment rouge.** [On some forms of *Botrytis* of the *cinerea* type producing a red pigment.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 2, pp. 47–50, 1934.

From a very large series of isolations from some 150 hosts the author obtained 12 different strains of *Botrytis* (of the *B. cinerea* type) producing an abundant red pigment, the intensity of which varied with the strain and the production of which depended strictly upon carbohydrate nutrition. When two different strains were grown in the same dish a more intense pigmentation was set up along the line of demarcation between the colonies, though this did not develop when colonies of the same strain were grown together.

MELIN (E.). **Zur Frage des Antagonismus zwischen frei lebenden Mikroorganismen. Untersuchungen an Holzschliff.** [A contribution to the problem of the antagonism between free living micro-organisms. Investigations on wood shavings.]—*Arch. für Mikrobiol.*, iv, 4, pp. 509–513, 1933.

From wood shavings from 17 sawmills in different parts of Sweden the writer isolated various Torulopsidaceae which proved capable of inhibiting the growth, both on the natural substratum and in malt extract, of certain Dematiaceae occurring in the same habitat, predominantly represented by the blue-staining *Cadophora fastigiata* [*R.A.M.*, xii, p. 69], *Lecythophora lignicola* Nannf., and *Trichosporium heteromorphum* Nannf. (to be described in a forthcoming paper). The inhibitory substances extracted from one of the four types of *Candida* encountered and from a *Torulopsis* were

found to be non-thermostable and incapable of passage through a bacterial filter.

VANDENDRIES (R.). **Le cycle conidien haploïde et diploïde chez les Basidiomycetes.** [The haploid and diploid conidial cycle in the Basidiomycetes.]—*Comptes rendus Acad. des Sciences*, cxcviii, 9, pp. 842–843, 1934.

In addition to *Pholiota aurivella* [*R.A.M.*, xii, p. 186], *Polyporus squamosus* [ibid., ix, p. 81], *Trametes cinnabarina* [ibid., ix, p. 216], and *Pleurotus pinsitus* were found to bear oidiophores with oidia on hyphae showing clamp-connexions and thus belonging to the diploid mycelium. No reversion to the haploid condition, as in the case of *Pholiota aurivella*, was observed in the other species studied. The mycelium arising from a haploid oidium may fuse with a haplont of the opposite sex to produce a fertile diploid mycelium. The innumerable oidia arising from the latter serve to perpetuate the species through successive diploid generations.

RICE (MABEL A.). **The relation of Uromyces caladii and other rusts to their hosts.**—*Bull. Torrey Bot. Club*, lxi, 3, pp. 155–162, 3 pl., 1934.

On the basis of her studies on *Puccinia sorghi* [*P. maydis*] and *Uromyces caladii* [*R.A.M.*, xii, p. 388], the writer controverts Dufrénoy's statement that plasmolysis of the cellular cytoplasm follows haustorial penetration by various parasitic fungi [ibid., ix, p. 122]. Actually the haustorium merely causes the invagination and not the puncture (penetration) of the cytoplasm, the appearance of which is only slightly altered as compared with that of healthy cells. Little evidence was obtained in the writer's investigations of vacuolar fragmentation in infected cells.

CORNET (P.). **Observations cytologiques à propos de Viola hirta parasitée par Puccinia violae (Schum.) D.C.** [Cytological observations in connexion with *Viola hirta* parasitized by *Puccinia violae* (Schum.) DC.]—*Comptes rendus Soc. de Biol.*, cxv, 1, pp. 52–53, 1934.

The cells of *Viola hirta* (in the Lyons district of France) surrounded by the mycelial stroma of *Puccinia violae* [*R.A.M.*, v, p. 669] contain only a few chloroplasts of reduced dimensions (3 to 5 measuring 2·5 by 1·5 $\mu$ compared with 13 of 5 by 5 $\mu$ in normal plants). Similar observations were made in the cells adjoining those actually in contact with the mycelium. The chloroplasts in the invaded areas were somewhat elongated, possibly in preparation for the process of fusion into moniliform circlets described by Beauverie (*Comptes rendus Acad. Sci.*, clxxii, p. 1195, 1921). The diminution in numbers and size of the chloroplasts of infected cells has also been observed by the writer in several other rusts, which are enumerated.

BURNETT (G.). **The longevity of the latent and veinbanding viruses of Potato in dried plant tissue.**—*Phytopath.*, xxiv, 3, pp. 215–227, 1934.

In a series of inoculation tests at the Washington State College

involving 3,743 Connecticut Havana tobacco and John Baer tomato plants, the latent ('healthy potato') virus [*R.A.M.*, xiii, p. 463], when unmixed with any other virus, was found to retain its infectivity after 286 days' desiccation in the former compared with only 50 days in the latter plant, the corresponding period for potato being 263 days. In a series of experiments with the veinbanding virus alone on 2,355 tobacco plants, infectivity was retained after 50 days' drying in potato and tobacco as against only 17 in tomato. In a further series of trials on 1,510 tomato plants the healthy potato virus in combination with tobacco mosaic (producing tomato streak), remained infective on drying longer than when similarly treated alone, being recovered from potato, tomato, and tobacco foliage after periods of 352, 1,251, and 618 days, respectively.

RUHLAND (W.) & WETZEL (K.). **Zur Physiologie der sogenannten Blattrollkrankheit der Kartoffelpflanze.** [A contribution to the physiology of the so-called leaf roll disease of the Potato plant.]—*Ber. Verhandl. Sächs. Akad. Wiss. Leipzig, Math.-Phys. Kl.*, lxxxv, 3, pp. 141–149, 1933. [Received May, 1934.]

The leaves and tubers (dormant and sprouted) of Alma potato plants suffering from leaf roll were found by Lehmann's and Kerstan's methods (*Planta*, xiii, p. 575, 1931; xvii, p. 491, 1932) to contain a disproportionately high dextrin and low sugar content as compared with healthy ones. Diastatic activity was much lower in the former, accompanied by a reduction of assimilatory capacity, transpiration, and respiration [cf. *R.A.M.*, xii, p. 238; xiii, p. 465].

FOLSOM (D.). **Growing seed Potatoes under an Aster cloth cage.** —*Amer. Potato Journ.*, xi, 3, pp. 65–69, 1934.

Promising results in the growing of seed potatoes free from virus diseases (leaf roll, mosaic, and spindle tuber) in Maine [*R.A.M.*, xii, p. 612] have been given in preliminary experiments by growing the plants under cheesecloth cages such as those used for the protection of asters [*Callistephus chinensis*] in Wisconsin [against yellows: ibid., xi, p. 302]. Directions are given for the construction of a cage, the total cost of which (covering 48 sq. rods, 66 × 198 ft.) is estimated at $240 for the first year and at $140 for each of the second to the fifth years. In 1933 both potato and spinach aphids [*Macrosiphum gei* and *Myzus persicae*] were found in the open field to the extent of 122 per 50 leaves on 24th July, while none could be detected on the corresponding number of leaves on caged plants.

SCHULTZ (E. S.), BONDE (R.), & RALEIGH (W. P.). **Isolated tuber-unit seed plots for the control of Potato virus diseases and blackleg in Northern Maine.**—*Maine Agric. Exper. Stat. Bull.* 370, 32 pp., 8 pl., 2 figs., 1934.

After a brief reference to the economic importance of potato virus diseases in northern Maine, a detailed account is given of experiments on the control of these diseases by roguing in specially established, isolated seed plots at the Aroostook Farm, in which the four seed pieces from one tuber were planted in a group of four adjacent hills in one row, and separated from the next similar

group by an empty space in the row. Six years' continuous experimental roguing in a typical seed plot of Green Mountain potatoes on the farm prevented the increase of the diseases beyond 7 per cent., as compared with an increase of up to 91 per cent. in a neighbouring unrogued field. It was again shown that leaf roll and spindle tuber are easier to control by this method than mild mosaic [*R.A.M.*, vi, p. 248, and above, p. 495], and giant hill [ibid., v, p. 179] was easily eliminated from the plot. Four roguings per season appear to be desirable. Some details are also given of similar small-scale experiments on commercial potato farms and in clearings in the woods, in 12 of which there was an increase in mosaic from one year to the next, while in 12 other cases there was either a decrease or a maintenance of freedom from the disease. In these tests no plot was consistent throughout the two to five years of the experiments, and no one season gave similar results from all the plots. While the location of the seed plots in the wood clearings appeared to favour control to a certain measure, the success or otherwise of roguing did not appear to stand in any connexion with insect records, the distance of the plots from other potatoes, or other similar factors.

It is believed that the relative facility of the control of leaf roll and spindle tuber, as compared to that of mild mosaic, is due to the fact that efficient vectors of the last-named disease are generally more numerous in the region than those of the former two. The paper also contains a discussion of the practical advantages of the tuber-unit method of planting, and some recommendations for effective roguing. Incidentally the work showed that the control of potato blackleg [*Bacillus phytophthorus*] is easier and more nearly complete through planting freshly cut seed pieces, as is usually done in the method described, than through roguing, seed selection, and seed treatment.

**The propagation and maintenance of healthy stocks of Potatoes.**—*Govt. of Northern Ireland, Min. of Agric. Leaflet* 73, 8 pp., 8 figs., 1934.

To establish potato stocks of a high standard of health the Ministry of Agriculture of Northern Ireland in 1926 initiated a scheme of selection and propagation. In the first year the selections were made chiefly from Arran Victory, the variety most extensively grown, though a few selections were also made from Champion, but later on a start was made with other leading varieties, including Up-to-Date and Majestic.

The method used in the initial stages was to select from growing crops numerous individual plants apparently free from leaf roll and mosaic. The tubers from each plant constituted a separate unit; the various units were planted apart from one another in a turnip crop, at a considerable distance from other potatoes. In the following seasons the healthy produce was planted separately among turnips isolated from potato crops. Small supplies from the healthy units were later distributed for bulk propagation to farmers who agreed to continue to propagate them at a considerable distance from other potato crops, to plant them in fields not sown

to potatoes for at least five years previously, and to rogue out all diseased plants several times a year.

Comparisons of the yields of the selected healthy stocks of Arran Victory and the farmers' own stocks of the same variety made during three years in thirty-three localities showed an average increase in favour of the former of 1 ton 17 cwt. per acre.

In the inspection and certification of potato crops for purity, the Ministry classifies as 'stock seed' any potato crops found on inspection to be (1) practically free from visible mosaic and leaf roll, (2) free from any other disease which might seriously impair the productiveness of the progeny, (3) practically 100 per cent. true to type, and (4) effectively isolated from unhealthy potato crops. In 1933, 142 acres of Arran Victory and 12 acres of Champion were listed as suitable for stock seed, while about 1,000 acres of the former and 200 acres of the latter, as well as large areas of Arran Victory in scheduled districts, were certified as the progeny of stock seed and as of a high standard of health.

VERPLANCKE (G.). **Étude comparative de Pommes de terre d'origines diverses. III. Résultats des expériences faites en 1933.** [A comparative study of Potatoes of various origins. III. Results of experiments made in 1933.]—*Bull. Inst. Agron. et des Stat. de Recherches de Gembloux*, iii, 1, pp. 52–91, 3 graphs, 1934. [Flemish, German, and English summaries.]

Further tests conducted during 1933 in various localities in Belgium of the relative value of certificated seed potatoes of the Industrie variety from Holland and the Ardennes completely confirmed the results previously obtained as to the superiority in respect of degeneration diseases of the former [*R.A.M.*, xii, p. 585]. Observations on the presence of virus diseases showed that leaf roll practically halved the yield, while in some localities the disease increased by 50 to 70 per cent. in one year; in one district leaf roll increased by 15 and 20 per cent. in one year for the Dutch and Belgian plants, respectively. Controlled Ardennes potatoes in one experimental area were 88 per cent. healthy, with 4 per cent. mottling, 3 per cent. mosaic, 1 per cent. leaf roll, and 1 per cent. crinkle, as against 97 per cent. healthy with only leaf roll (1 per cent.) as a serious disease in the Dutch seed.

DUCOMET (V.) & DIEHL (R.). **La culture de la Pomme de terre en montagne et les maladies de dégénérescence.** [Potato cultivation in the mountains and degeneration diseases.]—*Comptes rendus Acad. d'Agric. de France*, xx, 7, pp. 228–238, 1934.

The writers' comparative observations in 1932–3 on Bintje, Institut de Beauvais, Imperia, Cellini, Favoriet × Shamrock 5, and Fin de Siècle × Shamrock 9 potatoes (*a*) at the Central Plant Improvement Station at Versailles, and (*b*) in the mountains at Saint-Nizier (Isère) showed that the influence of the 'degeneration' diseases on yield was at least as marked at the higher altitude as at the lower [*R.A.M.*, xii, p. 56; xiii, p. 390]. The symptoms were more sharply defined in the mountains, while in certain cases, especially among the medium-early and medium-late varieties, the

activity of the insect vectors of virus diseases was much greater in the low-lying situation.

COSTANTIN (J.), MAGROU [J.], BOUGET, & JAUDEL (Mlle V.). **Production expérimentale de mycorhizes chez la Pomme de terre.** [The experimental production of mycorrhiza in the Potato.]—*Comptes rendus Acad. des Sciences*, cxcviii, 13, pp. 1195–1197, 1934.

The roots of two potato (Maréchal Franchet d'Esperey variety) plants, raised from true seed at an altitude of 1,400 m. in the Pyrenees in virgin soil, were found to be profusely provided with a typical endophytic mycorrhiza having arbuscules, sporangioles, and vesicles [cf. *R.A.M.*, xii, p. 310]. In other plants the endophyte was present but had been more or less completely absorbed by the host. Similar but slighter development was found in plants grown from seedlings transferred from the plains when three months old to cultivated mountain soil. In some roots the endophyte closely resembled that found in local *Orobus tuberosus* plants, and it would appear that an identical fungus is capable of contracting a symbiotic relationship with plants belonging to widely separated families.

MACLEOD (D. J.) & HOWATT (J. L.). **Soil treatment in the control of certain soil-borne diseases of Potatoes.**—*Amer. Potato Journ.*, xi, 3, pp. 60–61, 1934.

Since 1928 the writers have obtained good control of potato scab (*Actinomyces scabies*) and black scurf (*Rhizoctonia* [*Corticium*] *solani*) in New Brunswick, Canada, by the addition to the soil of mercuric or mercurous chloride in dry form at the rate of 10 to 15 lb. per acre [*R.A.M.*, xiii, p. 466], diatomaceous and other earths being employed as diluents to facilitate application and ensure uniform distribution. A slight reduction of yield was caused by the fungicides, which were harmless, however, to cereal crops and did not reduce the activity of nitrogen-fixing organisms. Club root of turnips [*Plasmodiophora brassicae*] and certain damping-off diseases of ornamentals also showed signs of yielding to this treatment. Red copper oxide [ibid., xiii, p. 388] was also effective against club root of turnips, while brown heart in the same crop [ibid., xi, p. 276] was controlled by sodium tetraborate (10 lb. per acre).

TAYLOR (C. F.). **Field experiments on Potato-scab control in western New York.**—*Amer. Potato Journ.*, xi, 2, pp. 40–45, 1934.

Further experiments confirmed the increase in the incidence of potato scab [*Actinomyces scabies*] in soils of fairly high $P_H$ values (about 6·0) in western New York following seed treatment with mercurial preparations or the application of the latter to the soil [*R.A.M.*, xii, p. 652]. Spring applications of sulphur after ploughing consistently reduced scab during the past three years, whereas no current season control followed the same treatment before ploughing. Finely ground sulphur proved more effective than inoculated. A pronounced degree of resistance to *A. scabies* was

shown by the Netted Gem, Russet Rural, and White Blossom Irish Cobbler varieties.

BLODGETT (F. M.) & HOWE (F. B.). **Factors influencing the occurrence of Potato scab in New York.**—*Cornell Agric. Exper. Stat. Bull.* 581, 12 pp., 1 fig., 1 map, 2 graphs, 1934.

In a survey carried out in New York State in 1931–2 in which 313 lots each of 100 potatoes were examined in various localities, 13·1 per cent. of the tubers were affected by scab [*Actinomyces scabies*: see preceding abstracts]. The average percentage of infection was generally higher in soils containing much, than in those containing little, lime. When the data were classified on a basis of soil tests made at a depth of three feet it was found that in medium or heavy soil there was more scab in fields with an alkaline, than in those with an acid subsoil, the average amount of scab for the two types of soil being, respectively, 20·1 and 8·9 per cent.; light soils showed no significant difference in the amount of scab present. Infection on soils with a $P_H$ value from 4·3 to 5·4 averaged 5·22 per cent., the figures for those with $P_H$ 7·5 to 8·5 and 5·45 to 7·4 being, respectively, 10·67 and 23·22 per cent. [*R.A.M.*, xii, p. 717]. The maximum scab occurred at about $P_H$ 6·6. Figures [which are tabulated] indicated some indirect relation between elevation and the occurrence of soils favourable to scab, there being significantly more infection at elevations between 400 and 1,200 ft. than at others below or above these limits. If the $P_H$ factor is left out of account as far as possible, the varieties locally grown fall into the following order of increasing susceptibility: Russet Rural, Smooth Rural, Cobbler, Green Mountain, and Up-to-Date.

There was some evidence that less scab occurred when potatoes followed sod than when they followed potatoes or other cultivated crops.

DIPPENAAR (B. J.). **Fusarium-rot in Potatoes.**—*Farming in South Africa*, ix, 95, p. 58, 1 fig., 1934.

A popular note is given on the *Fusarium* tuber rot of potatoes, which is stated to have caused losses amounting to 40 per cent. or more in the seed tubers in the winter rainfall area of the western Cape Province during the last two years [*R.A.M.*, xiii, p. 260]. The exact incidence in South Africa of the various species concerned in the rotting of potatoes is not known, but *F. bulbigenum*, *F. orthoceras*, *F. oxysporum*, and *F. coeruleum* are among those involved. The symptoms of the disease, the conditions favouring infection, the sources of the latter, and control measures are briefly discussed.

KNOBLAUCH (H. C.) & ODLAND (T. E.). **The response of Potatoes to magnesium under various soil conditions.**—*Amer. Potato Journ.*, xi, 2, pp. 35–40, 1934.

Under Rhode Island conditions, the incorporation of magnesium with various phosphorus carriers markedly increased the yields of potatoes on acid soils, where chlorosis due to magnesium deficiency is very prevalent [*R.A.M.*, xii, p. 654]. In one co-operative field

experiment the output was increased by some 100 bushels per acre by the application of magnesium sulphate at the rate of 100 lb. per acre. All the forms of magnesium used in these trials (sulphate, hydrate, and limestone) were found to be equally effective when supplying at least 25 lb. magnesium oxide per acre. For acid soils 25 to 35 lb. magnesium oxide per acre should be mixed with the fertilizer or an occasional top dressing of magnesium limestone given.

SUZUKI (H.). **Studies on an infection-type of Rice diseases analogous to the flower infection. I. On Piricularia oryzae Br. et Cav.**—*Ann. Phytopath. Soc. Japan*, iii, 1, pp. 1–14, 1 fig., 1934. [Japanese, with English summary.]

Inoculation experiments on rice with *Piricularia oryzae* [*R.A.M.*, xiii, pp. 264–267] showed that seed infection may occur before, during, and after the flowering period and the kernel may be infected without any symptoms being visible on the glumes. In cases of severe infection the kernels failed to develop and only the empty glumes were left. There was sometimes little difference in weight between obviously diseased kernels and those of healthy appearance in the inoculated lots (from which the fungus was also reisolated) or the controls. The inoculated seeds were found on microscopic examination to contain the hyphae of *P. oryzae* in the tissues of the embryo, endosperm, bran layers, and glumes, and in some cases both hyphae and conidia were detected between the glume and the kernel. Seedlings arising from sterilized, inoculated kernels on Sachs's nutrient agar soon developed symptoms of blight or rot and died. Germination was not appreciably impaired by inoculation of the seeds with *P. oryzae* at any of the above-mentioned times.

ITO (S.) & IWADARE (S.). **Studies on the red blotch of Rice-grains.**—*Hokkaido Agric. Exper. Stat. Rept.* 31, pp. 1–84, *1–3*, 3 pl. (1 col.), 1934. [Japanese, with English summary.]

Two species of *Epicoccum* have been found to cause the 'red blotch' disease of harvested rice grains, associated with a complete loss of germinative capacity, in Hokkaido, Japan, namely, *E. neglectum* [*R.A.M.*, xii, p. 533] and a new species to which the name of *E. oryzae* Ito & Iwadare is given [with a Latin diagnosis]. The new *Epicoccum* is characterized by branched, septate, olivaceous hyphae, 3·7 to 6·2 $\mu$ in diameter; globose or subglobose, black, punctiform sporodochia, 45 to 210 $\mu$ in diameter; and yellow to olivaceous conidiophores, 2·5 to 7·5 $\mu$ long, bearing globose, subglobose, or piriform, granular-verrucose, olivaceous conidia, 9·9 to 23·1 by 6·6 to 16·5 $\mu$, consisting of one to five cells.

Both *E. oryzae* and *E. neglectum* (of which three strains were differentiated) produce a pinkish-red pigment on various standard media, the optimum for this process being below 15° C. for *E. neglectum* A, 23° for *E. neglectum* B, and 25° for *E. neglectum* C and *E. oryzae*. The optimum temperatures for infection were found to be as follows: 14° to 23° for *E. neglectum* B and C, 19° to 23° for *E. neglectum* A, and 14° to 25° for *E. oryzae*. *E. neglectum* was isolated from wheat, oats, maize, beans (*Phaseolus vulgaris*),

and buckwheat, but has shown no power to infect the healthy leaves or stems of any of its hosts.

Under natural conditions the red blotch disease can assume a severe form when the rice plants collapse on to the ground during the later period of growth. Heavy infection further occurred when the plants were laid on the ground or stood upside down in bundles for some days after harvesting, whereas those that were hung up and dried on a bar remained practically free from red blotch. By this simple means, therefore, the serious defect of rice grains herein described may be effectively combated.

**Report of the Puerto Rico Agricultural Experiment Station, 1933.**—24 pp., 5 figs., 8 graphs, 1 map, 1934.

The following items of phytopathological interest occur in this report. A special survey was undertaken from 1931 to 1933 to determine the mosaic resistance of the Mayaguez 28 sugar-cane variety [*R.A.M.*, xii, p. 394], 14 fields being inspected in seven districts, nearly all in proximity to infected plantings of P.O.J. 36 or Co. 281. It was rare to find more than 3 or 4 per cent. infection on Mayaguez 28, whereas the incidence of the disease increased from a trace to 90 to 100 per cent. in the adjacent fields of susceptible varieties during the period of the observations. Where infection did occur among the Mayaguez 28 canes, the stools were usually completely diseased, indicating that mosaic cuttings had been planted and that secondary spread was negligible. In the Anasco and San German Valley districts, one roguing sufficed to keep the incidence of mosaic as low as 1·5 per cent. where healthy Mayaguez 28 cuttings were selected for planting. The introduction into localities such as Isabela, where mosaic is a limiting factor, of the resistant P.O.J. 2878 and Mayaguez 28 has greatly reduced the heavy expenditure formerly necessitated by replanting the stools of S.C. 12/4 destroyed by the disease. Crosses between P.O.J. 2878 and Mayaguez 28 appear to be commercially resistant to mosaic, comparing favourably with the standard varieties both at Coloso and Aguirre.

Ocfemia (G. O.). **An insect vector of the Fiji disease of Sugar Cane.**—*Amer. Journ. of Botany*, xxi, 3, pp. 113–120, 2 figs., 1934.

Full details are given of controlled experiments at the Los Baños College of Agriculture, Laguna, Philippine Islands, in which the Fiji disease was transmitted by adults of the leafhopper, *Perkinsiella vastatrix*, from infected to healthy shoots of one-node cuttings of P.O.J. sugar-cane grown in insect-proof cages [*R.A.M.*, xiii, p. 182]. The incubation period of the disease ranged from 28 to 86 days. The first symptom of the disease in these tests was the development of minute galls on any part of the lower surface of the leaves and midribs, followed two or three weeks later by shortening of the foliage.

Briton-Jones (H. R.) & Baker (R. E. D.). **Thread blights in Trinidad.**—*Trop. Agriculture*, xi, 3, pp. 55–67, 6 pl., 1934.

After a brief reference to the literature dealing with true thread

blights in tropical regions and in the United States [38 records of which are listed in an appendix], the authors give a brief description of those which they collected in 1933 in Trinidad on various plants. Though fructifications were not found in any, all the forms encountered could be referred on the basis of their mycelial characters to the two categories defined by Petch [*R.A.M.*, iv, p. 67] as *Corticium* and marasmioid thread blights, respectively. Of the seven marasmioid and eight *Corticium* forms that were collected, five and three respectively were isolated and tested in inoculation experiments with pure cultures. The cultural characters of the forms studied [which are shown in a second appendix] indicated that the five marasmioid isolations included three separate fungi which, in all probability, belong to the genus *Marasmius*, this view being supported by the fact that in the form M4 on cacao, immature *Marasmius* fructifications were found on leaf laminae near the threads of the fungus, although apparently not organically connected with the latter. The three isolations of *Corticium* proved to be different from one another; of these, C1 on *Coffea arabica* was identified by the authors as *C. koleroga*, and C2 on grapefruit as *C. stevensii*; the identity of the third isolation (C5) could not be determined, and it may be either a strain of one of the other two, or a separate species. Of the strains of the *Corticium* group not cultured, it is considered fairly safe to identify C6 on *Coffea robusta* as *Corticium koleroga* and C4 on nutmeg as *C. stevensii*, the other three remaining unidentified.

Briton-Jones (H. R.) & Baker (R. E. D.). **Notes on some other fungous diseases in Trinidad, 1933.**—*Trop. Agriculture*, xi, 3, pp. 67–68, 2 pl., 1934.

Brief notes are given on four plant pathogenic fungi observed by the authors in Trinidad in 1933 as unusually prevalent, presumably owing to the exceptionally wet conditions. These were a species of *Septobasidium* (possibly *S. pseudopedicellatum*) [*R.A.M.*, x, p. 654] and *Corticium salmonicolor* on grapefruit, *Rhizoctonia* [*Corticium*] *solani* on briar rose, and *Sclerotium rolfsii* on a number of economic plants, including sugar-cane, citrus, tomato, *Tephrosia purpurea*, sunflower, *Crotalaria usaramoenis*, soy-bean, banana (*Musa cavendishii*), *Phaseolus aureus*, and French beans (*P. vulgaris*).

Gadd (C. H.). **Report of the Mycologist for 1933.**—*Tea Res. Inst. Ceylon Bull.* 11 (*Ann. Rept. for the year 1933*), pp. 20–25, 1934.

During 1933, tea on one estate in Ceylon was attacked by a previously unobserved *Sphaerulina*, accompanied sometimes by *Colletotrichum camelliae* [*Glomerella cingulata*: *R.A.M.*, x, p. 345]. The attack normally occurred on the leaf margin, though infection was sometimes present near the midrib; the infected area was red-brown, not zoned, and rather brighter than parts attacked by *G. cingulata*. The partly erumpent, black, ovoid perithecia were thinly scattered over both sides of the leaf; the cylindrical to clavate asci measured 69 to 78 by 10 to 12 $\mu$, and contained eight ovate-elliptical, 3-septate, hyaline ascospores, measuring 17 to 20

by 6 $\mu$. Inoculations through wounds with pure cultures of the fungus gave positive results.

Tea branch canker, normally due to *Macrophoma theicola* or its perfect stage *Physalospora neglecta* [ibid., x, p. 760], was associated in certain cases with an Ascomycete (possibly a species of *Leptosphaeria*) having fusoid, multiseptate spores measuring 40 to 45 by 8 to 10 $\mu$; another *Leptosphaeria* with 3-septate spores measuring 12 to 16 by 3 to 4 $\mu$ and constricted at the septum was found on one specimen. While no correlation can be established in Ceylon between the incidence of branch canker and that of mosquito blight, as in the similar disease in Nyasaland [ibid., xii, p. 332], there is no conclusive evidence that the fungi constantly associated with the later stages of the former can invade uninjured tissues.

Soil applications of powdered sulphur gave very inconsistent results in the control of witches' broom of tea [ibid., xii, p. 597], and the inclusion of sulphur in a manure mixture had no appreciable effect on the incidence of the disease. Although witches' broom in many respects resembles the yellows disease found in Nyasaland [loc. cit.], the causes of the two conditions are evidently different; the origin of witches' broom in Ceylon remains obscure.

DUGGAR (B. M.) & HOLLAENDER (A.). **Irradiation of plant viruses and of micro-organisms with monochromatic light. I. The virus of typical Tobacco mosaic and Serratia marcescens as influenced by ultraviolet and visible light. II. Resistance to ultraviolet radiation of a plant virus as contrasted with vegetative and spore stages of certain bacteria.**—*Journ. of Bact.*, xxvii, 3, pp. 219–256, 1 fig., 3 diags., 9 graphs, 1934.

The physical installation used in these studies included a quartz monochromator, an intense source of radiation (Daniels-Heidt capillary mercury vapour lamp), a quartz exposure-cell (mechanically stirred), an exposure tank provided with a quartz window, and a sensitive thermopile. Twelve spectral lines or groups of lines were investigated in the range $\lambda$ 2,537–6,120 Å. The temperature of the exposure was maintained at 1° to 2° C. by means of melting ice. The biological materials consisted of a fresh suspension of semi-purified tobacco mosaic virus [*R.A.M.*, xiii, p. 328], and of *Serratia marcescens* [Chromobactereae] taken from a bouillon culture during the logarithmic growth phase. For the determination both of lethal effects on the bacteria and of inactivation of the virus, materials were combined in the same suspension to obtain comparative values. Dilutions of the bacteria were prepared in physiological salt solution. Poured agar plates were made and the counts gave a quantitative comparison of the irradiated cultures with the unirradiated controls. The percentage inactivation of the virus was determined by the results of inoculations on Wisconsin Havana 142 tobacco plants.

The inactivation of the virus was found to be confined to wavelengths shorter than about $\lambda$ 3,100 Å, at which point the energy required to produce any perceptible effect is more than 100 times

as much as is necessary at λ 2,652 Å. The energy values representing 100 per cent. bacterial destruction were far below those having any measurable action on the virus, the resistance ratio of the latter to that of *S. marcescens* being of the order of 200:1. The greatest effect on both was at λ 2,652 Å.

In a further series of experiments certain modifications were introduced in the above-mentioned apparatus, especially in respect of the exposure cell. This consisted of an inverted T tube with the horizontal tube cut close to the vertical on each side, the resultant short cylinder at the bottom being closed on each side with a crystalline quartz slip serving as windows. The cell was equipped with a stirrer and a liquid seal. A suspension technique and dilution culture procedure adapted to the requirements of the organisms selected were employed in a study of the resistance of the vegetative and spore stages of *Bacillus subtilis* and *B. megatherium* [*R.A.M.*, xi, p. 318; xiii, p. 233] as compared with that of *S. marcescens* and the tobacco mosaic virus to monochromatic ultraviolet radiation.

The results are expressed in the form of survivor curves for the different wave-lengths and for varying intensities of the wave-lengths employed. It was found that the resistance of the virus irradiated coincidentally and in the same suspension with the bacteria is so much greater as to represent a different order of magnitude.

GRATIA (A.). **Identification sérologique et classification des virus des plantes. Distinction entre l'antigène mosaïque et l'antigène végétal.** [Serological identification and classification of plant viruses. Differentiation between the mosaic and plant antigens.]—*Comptes rendus Soc. de Biol.*, cxv, 11, pp. 1139–1241, 1934.

To the two antigens, namely, normal tobacco and mosaic, present in mosaic tobacco plants [*R.A.M.*, xiii, p. 275] correspond different antibodies in the serum which may be separately adsorbed by fractionated saturation. By this means the writer succeeded both in freeing the anti-mosaic sera from their anti-plant antibodies, and also in separating the flocculable plant element from the mosaic juices.

To concentrated and thoroughly centrifuged mosaic tobacco juice 4 per mille formol was added and the mixture left for six weeks in the autoclave to make an anatoxin or rather an 'anavirus'. A precipitate was gradually formed and settled by degrees, while the supernatant liquid became transparent and colourless. Appropriately diluted and supplemented by the corresponding anti-mosaic serum, a very well-marked specific flocculation was given by the 'anavirus', whereas no such effect followed the addition of a serum prepared against another mosaic. It is thought highly probable that the 'anavirus', injected into rabbits, will furnish excellent anti-mosaic sera devoid of anti-plant antibodies. The present technique should serve to extend the serological method of diagnosis to other plant viruses and possibly also to kindred diseases of animals.

CLAYTON (E. E.). **Toxin produced by Bacterium tabacum and its relation to host range.**—*Journ. Agric. Res.*, xlviii, 5, pp. 411–426, 6 figs., 1934.

This is a detailed account of the author's study of the toxin produced by the tobacco wildfire organism (*Bacterium tabacum*), and of its effect either alone or together with the bacterium on various hosts, including tobacco, a full abstract from which has already been noticed [*R.A.M.*, xii, p. 401].

**Amtliche Pflanzenschutzbestimmungen.** [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, v, 8, pp. 222–223, 236–243; 9, pp. 248–250, 261–263, 275, 1934.

BELGIAN CONGO (KATANGA PROVINCE). An Order dated 10th January, 1931, provides that every consignment of seeds, bulbs, or plants imported from any foreign country into Katanga Province, Belgian Congo, shall be accompanied by an officially authenticated certificate of freedom from fungous diseases and insect pests. In the event of detection of fungous or other diseases in the consignments, whether destined to remain in the Province or for transport, the proper authorities must immediately be notified.

AUSTRIA (PROVINCE OF LOWER AUSTRIA). Among the particularly destructive plant diseases and pests to be combated by the Order of 29th November 1933, of the Provincial Government of Lower Austria, supplementing that of 29th May 1931, is black rot of the vine (*Laestadia* [*Guignardia*] *bidwellii*) [*R.A.M.*, xi, p. 416], the detection of which is notifiable to the proper authorities. *Peronospora* [*Plasmopara viticola*], 'roter brenner' [*Pseudopeziza tracheiphila*], *Oidium* [*Uncinula necator*], and other highly contagious diseases of the vine may only be combated by methods approved by the Federal Institute of Plant Protection or the Agricultural Chamber of the Province of Lower Austria.

Junipers infected by trellis rust [*Gymnosporangium sabinae*: ibid., vii, p. 251; viii, p. 796; xi, p. 799] in the vicinity of pear trees must be removed and burnt.

The tips of gooseberry shoots attacked by American mildew [*Sphaerotheca mors-uvae*] must be cut off and burnt in the autumn.

On or before 15th March in each year full particulars concerning the management and organization of all nurseries (other than those of a purely private character) must be furnished to the Lower Austrian Agricultural Chamber, together with the approximate numbers of (*a*) fruit trees, (*b*) soft fruit plants, (*c*) conifers, and (*d*) other trees and shrubs grown. The following diseases in particular will engage the attention of the official inspectors of nurseries and similar establishments: apple mildew [*Podosphaera leucotricha*]. American gooseberry mildew [*S. mors-uvae*], leaf curl of peaches [*Taphrina deformans*], scab [of apple and pear: *Venturia inaequalis* and *V. pirina*], and crown gall [*Bacterium tumefaciens*] and canker [*Nectria* spp.] of fruit and other trees. The municipal authority must be apprized of the presence of gooseberry mildew in a nursery.

GERMANY (BAVARIA). By Ministerial Ordinance of 19th January, 1934, steps must be taken before 15th March in each year to cut down all dying or dead fruit trees, together with any suffering to such an extent from fungous or insect attacks that treatment would appear hopeless, while at the same time witches' brooms [*Taphrina cerasi*: ibid., xi, p. 424] must be excised from cherry trees.

OLDENBURG: LÜBECK DISTRICT. As from 15th January, 1934, no barberries may be planted within a radius of 200 m. from cereal stands [with a view to the protection of the latter against *Puccinia graminis*: cf. ibid., xii, p. 736]. The eradication of wild barberries growing within this distance of the nearest cereal stand is incumbent upon the owner of the land.

SAXONY. The third (9th September 1933) and fourth (14th February, 1934) revisions of the Order for the prevention of the spread of potato wart [*Synchytrium endobioticum*] of 3rd July 1928 [cf. ibid., viii, p. 664; ix, p. 816] introduce certain modifications of the regulations, the main provisions of which are now as follows. No potatoes may be cultivated within a period of ten years on any plot found to bear diseased plants. For eight years (beginning at the latest with the commencement of the next year but one after the detection of infection) only the officially authorized wart-resistant ('field-immune') potato varieties (lists of which are issued regularly by the German Plant Protection Service) may be grown on plots under the same agricultural or horticultural management as those found to be infested. Plots of less than 1,000 sq. m. in extent are to be planted exclusively with wart-resistant varieties. As from 1st January 1932 (in the absence of contrary provisions arising out of the foregoing) only wart-resistant varieties may be cultivated in the Dresden, Leipzig, Coswig, and Cossebaude districts.

SOUTHERN RHODESIA. Government Notice No. 130 of 24th February, 1933, prohibits the importation into Southern Rhodesia of citrus trees, fruits, and dried peel from Mozambique Territory on account of plant diseases [especially citrus canker, *Pseudomonas citri*: cf. ibid., xiii, p. 64].

**Legislative and administrative measures. Madagascar and Dependencies.**—*Internat. Bull. of Plant Protect.*, viii, 3, p. 56, 1934.

As from 14th December 1933, the Comoro Islands, Madagascar, have been declared infected by sugar-cane mosaic, and any exportation of plants, cuttings, and seed of this crop from the diseased area to other parts of the territory of Madagascar and its Dependencies is prohibited.